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ASSET-LIABILITY MANAGEMENT/INTEREST RATE RISK OF BANKS IN SOUTH DAKOTA

BY

PIUS REIS

A thesis submitted in partial fulfillment
of the requirements for the degree
Master of Science
Major in Economics
South Dakota State University
1987

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ACKNOWLEDGEMENT

I would like to take this opportunity to express my gratitude and appreciation to all those who have offered their guidance, criticism, and encouragement throughout the duration of my study.

I would especially like to thank Dr. Charles Lamberton, my thesis advisor, and Dr. Bill Kamps for their invaluable guidance and suggestions. A special thanks to Verna Clark for her contribution in typing the manuscript, and to Randy Van Beek for his help in computer programs. Also, my deepest and sincere appreciation to my fellow graduate students for their friendship and encouragement.

This thesis is dedicated to my family, though far away, I feel their support everyday.

ASSET-LIABILITY MANAGEMENT/INTEREST RATE RISK

OF BANKS IN SOUTH DAKOTA

This thesis is approved as a creditable and independent study by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Dr. Charles E. Lamberton
Major and Thesis Advisor

Date

Dr. Ardelle Lundeen
Head, Economics Department

Date

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CHAPTER I

Introduction

With higher inflation rates in the 1960s and 1970s, the phasing out of the regulation of interest rates, the elimination of state usury laws, and the 1979 change in operating procedures by the Federal Reserve, interest rate fluctuations increased significantly. As interest rates rose and fell, dollar denominated assets and liabilities became subject to sudden changes, and corresponding changes in value caused corresponding changes in banks' net worth or capital. Such value changes are greater for long term securities than for short term securities. For example, when interest rates fluctuate the present (market) value of any given stream of cash will also change. A rise in interest rates would cause the present value of the given stream of cash to fall. Also, when interest rates change, the present values of different cash streams do not change in the same proportion. The further the net cash receipts are from the present, the larger the percentage change in the present value of the stream when rates change.

Banks with most of their assets and liabilities valued at fixed dollar amounts and relatively narrow capital bases are particularly susceptible to such interest rate risk. In addition to the effect on capital, banks must offer higher returns to retain deposits when interest rates rise. If these cannot be matched by earning a higher rate of return on longer term assets, the bank's profitability will be

damaged. Therefore, bank managers have found it necessary to carefully monitor their asset and liability portfolios and their exposure to interest rate risk.

Problem Statement

The framework of the regulatory structure of the banking industry was based on the Banking Acts of 1933 and 1935 until 1972, when reexamination of regulation began with the President's Commission of Financial Structure and Regulation, which led to the passage of the Depository Institutions Deregulation and Monetary Control Act of 1980. The Banking Acts of 1933 and 1935 were enacted following the banking collapse of the 1930s with the major provision of sheltering banks from excessive competition, and from the errors and poor judgment of their own managements. (Kaufman; Mote; Rosenblum, 1984) These Acts disallowed the payment of interest on demand deposits and authorized the Federal Reserve to set interest rate ceilings on time and savings deposits paid by commercial banks. (Gilbert, 1986)

Another regulation prohibited banks from branching across state lines, except for those banks that changed to a national charter and already had some interstate branches. (Wells; Scruggs, 1986) This regulation was imposed through the National Bank Act of 1864. The 1933 and 1935 regulations and restrictions on banks stayed intact for about half a century. However, restrictions were eased as the economic and technical environments changed rapidly in the 1960s and 1970s. (Kaufman; Mote; Rosenblum, 1984) The scenario in the 1960s was that

banks found themselves increasingly squeezed by deposit rate regulations and restrictions on activities that hindered their pursuit of profitable opportunities. In the 1970s, regulation was characterized by accomodating competition as far as current law permitted. Despite regulators' responses to the changing financial environment, regulation tended to lag developments in the financial markets and much effort was spent simply in bringing regulation by law into alignment with the actual situation that prevailed. (Kaufman; Mote; Rosenblum)

Because of a near crisis in the financial markets in the spring of 1980 and the pressure of a judicially established deadline to validate the regulatory agencies authorization of negotiable order of withdrawal (NOW) accounts, Congress enacted the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980. (Kaufman; Mote and Rosenblum) Merrick and Saunders (1985) stated that the DIDMCA of 1980 and the Garn-St. Germain Depository Institutions Act (1982) "are the two most significant pieces of bank legislation since the 1930s. Their significance stems from the fact that they have sought to roll back a number of the regulations and restrictions imposed on banks' activity and competition in the 1933-80 period."

The DIDMCA of 1980 had two purposes. One was to place financial institutions of all types on a more even footing so as to engage in a much broader range of financial activities than was the case before, and subject them to market competition to regulate the industry's relations with the public. The second purpose of the Act was to give

the Federal Reserve System broader control over the monetary aggregates and thus potentially provide greater stability to the U.S. economy.

Maisel (1981) referred to interest rate risk as a concern which arises from a mismatch of the maturity structure of an institution's assets and liabilities. Depending on the degree of mismatch, banks face some risks due to changes in interest rates because: (1) the term structure of interest rates shifts, therefore reducing the value of future receipts (flow of funds) as the term structure moves up; (2) interest rates received on assets and paid on liabilities, if tied to market rates, move with those rates; (3) cash flows are altered as the rate at which commitments are taken down changes, which results in assets paid off more or less rapidly, and deposit liabilities transferred. With deregulation, the risks faced by banks due to fluctuating interest rates have become more apparent.

Banks face two types of risks from volatile interest rates. The first, income risk, is the risk of loss in net interest income due to movements of borrowing and lending rates being imperfectly synchronized. This is because when rates change, the present value of any given stream of cash will also change. An increase in rates will cause the present value of the given stream of cash to fall; and changes in rates will not result in proportional changes in the present values of different cash streams. The second, investment risk, is the risk of loss in net worth from unexpected interest rate fluctuations. For example, if interest rates increase the market value of assets and liabilities fall. If the duration of assets is longer than the

duration of liabilities, then this results in a larger percentage reduction in the market value of assets than in the market value of liabilities because assets become more interest-elastic. The opposite occurs when rates fall. Both components of risk can be reduced by banks through a careful strategy of asset-liability management.

The effects of deregulation are continuously being assessed and can be explained in terms of the benefits and costs to both depositors and producers of financial services. Depositors benefit from the availability of

> a greater menu of assets from which to choose and earn (higher) returns on their savings, while borrowers can search more extensively for the best prices for loans and other financial services. For producers of bank products and services there is the benefit of choosing a portfolio of geographic and product activities that more closely approximates the set that maximizes stockholders wealth...On the cost side, the overriding concern has been the adverse effect deregulation might have on bank safety and soundness and the implications of this for financial and macroeconomic stability. (Merrick; Saunders, 1985)

Another factor that has an effect on the banking industry's viability and competitiveness is technological change. Technological change and its effect on banking competition is an important part of banking literature that is often overlooked. (Hunter; Timme, 1986) Due to Technological change, the interdependence among banks increased because of the desire to reduce the average cost in the industry in general. Technological change also increased the competition for funds because of the improved and speedy service, and the capacity to expand the geographic market. Consumers in different market locations can now be reached. The most significant impact of technological change has

been the transformation of financial institutions from a heterogenerous production line to a homogeneous blend. (Kane, 1984) Kane noted that

> during the last 15 years, technological change (in the form of the computerization of record keeping and transaction, the robotization of teller functions and expanding telecommunication links with customers, services and financial markets) has increased the role of multipurpose capital equipment in producing financial services. The desirability of spreading the costs of operating this telemation equipment across additional product lines underlies the rapid progress toward homogenization of function observed for different types of financial intermediaries. (p.761)

Because of the changing market environment created by technological change and deregulation of the banking industry, and the increased competition which has resulted, banks in general have had to adopt new management strategies to remain viable. The fluctuation of interest rates has compounded the risks faced by banks, especially the risks of returns to income and investment. The banks that survive in the new financial environment are those that learn to reduce their risks and also meet customer demands for financial services. (Toevs, 1983)

Drabenstott and McDonley (1982) explain that the deregulation of the banking industry and the access of rural savers to a wider assortment of savings instruments since the late 1970s have transformed the rural financial markets;

> as a result, rural community banks have been under increasing pressure to replace their noninterest bearing demand deposits with higher yielding deposit accounts, such as money market certificates. Consequently, these banks no longer hold a large pool of demand deposits with which to insulate themselves against adverse movements in national interest rates. Agricultural banks, therefore, faced with increased competition and integration of rural financial markets, are being significantly affected by volatile interest rates. (p. 10)

Wilson and Sullivan (1986) note that the financial positions of agricultural banks need to be examined because of the farm crisis. Due to the farm crisis, losses on loans "have been large enough to cause a substantial increase in the failure rate among agricultural banks --- agricultural banks have made up about two-thirds of all failed banks since July 1984; 62 agricultural banks failed during 1985." (Belongia; Gilbert, 1985) Because of the continuing growth in delinquent loan volume across the country the number of bank failures could grow still larger in 1986; by September 30, 1985, the vulnerable banks had increased to 719, up 100 from 1984's level. (Wilson; Sullivan, 1986) Belongia and Gilbert observed that there has been an increase in public concern about the continued viability of many banks that have been heavily committed to agricultural lending because of the apparent vulnerability of the banking system to the farm credit crisis. According to the authors, earnings at agricultural banks have fallen in recent years--with a return on equity (ROE) of 13 to 16 percent in the 1970s as compared to 9 percent by 1984. Wilson and Sullivan also found that a growing number of agricultural banks have been reporting negative earnings. Wilson and Sullivan also expressed the view that agricultural banks have indeed suffered from financial stress in the farm economy, and because they are predominantly small banks, they experienced elevated costs of funds as a result of their increasingly deregulated environment.

According to Brewer and Lee (1986), "economic risks--as reflected in uncertainty regarding economic growth, inflation, and

interest rates--have differential regional impacts because regulation and market forces have led banks to develop different exposures to risks...Depending on its part of the country, a bank may be more sensitive to certain kinds of risk." (p.25) This implies location and environment influence the degree of risk exposure faced by banks to fluctuations in interest rates.

South Dakota, with a predominantly agricultural economy, is made up of many small rural agricultural communities. Because of this aspect, the degree of risk exposure faced by rural banks in South Dakota due to volatile interest rates may be different from the results obtained from national studies or studies of other regions. Due to the recent farm economy crisis, the risks faced by banks that support these agricultural communities need to be evaluated.

Research Objectives

The purpose of this research is to evaluate the asset-liability management strategy and interest rate risk of banks in South Dakota from 1984 to 1986.

The specific objectives of this research are:

1. To examine and analyze the trends in market interest rates from 1984-1986.

2. To evaluate and compare the asset-liability management strategy and composition of banks by asset size.

3. To evaluate and compare the asset-liability management strategy and composition of banks by crop reporting district.

4. To examine, analyze and compare interest rate risk exposure of banks by asset size and by crop reporting district.

Procedures

This study will focus on banks located in rural or small communities in South Dakota whose economy is mainly agriculturally based. The rationale for this is to reduce the influence of other factors such as industrial growth within the environment. This criterion can be justified by the fact that much of South Dakota is made up of many small agricultural communities with banks that are from small to medium in size.

A sample of 44 banks was chosen from across the State's nine crop reporting districts. These banks were grouped by asset size into four categories: less than $10 million; $10-25 million; $25-50 million; and greater than $50 million. The asset-liability management strategy and composition of banks by size will be evaluated and compared. A Duncan multiple range test will be performed to test if the average assets and liabilities of each size group is significantly different. This test will determine if size is a major factor in asset-liability composition. Another analysis that will be presented is the asset-liability management strategy and composition of banks by crop reporting district. The crop reporting districts were grouped into four substate regions according to the major types of crops grown. The group of substate regions are: (1) North Central and Northeast CRD's; (2) East Central and Southeast CRD's; (3) Central and South

Central CRD's; and (4) Northwest and Western CRD's. As stated, the regions were formed to recognize the similarities in the types of crops grown. With each region there are similar farming practices and therefore a general pattern of capital requirements for farm operations. These differing capital needs of each region will have an effect on the risk exposure and management practices of banks across these regions.

The number of banks chosen within each region is spread among the counties as indicated in figure 1.1. This should allow for a better measure of bank performance within each region, which may not be as adequately measured if the selected banks were concentrated in certain areas within each region. This is also the reason for the pattern of the spread of sample banks in the State.

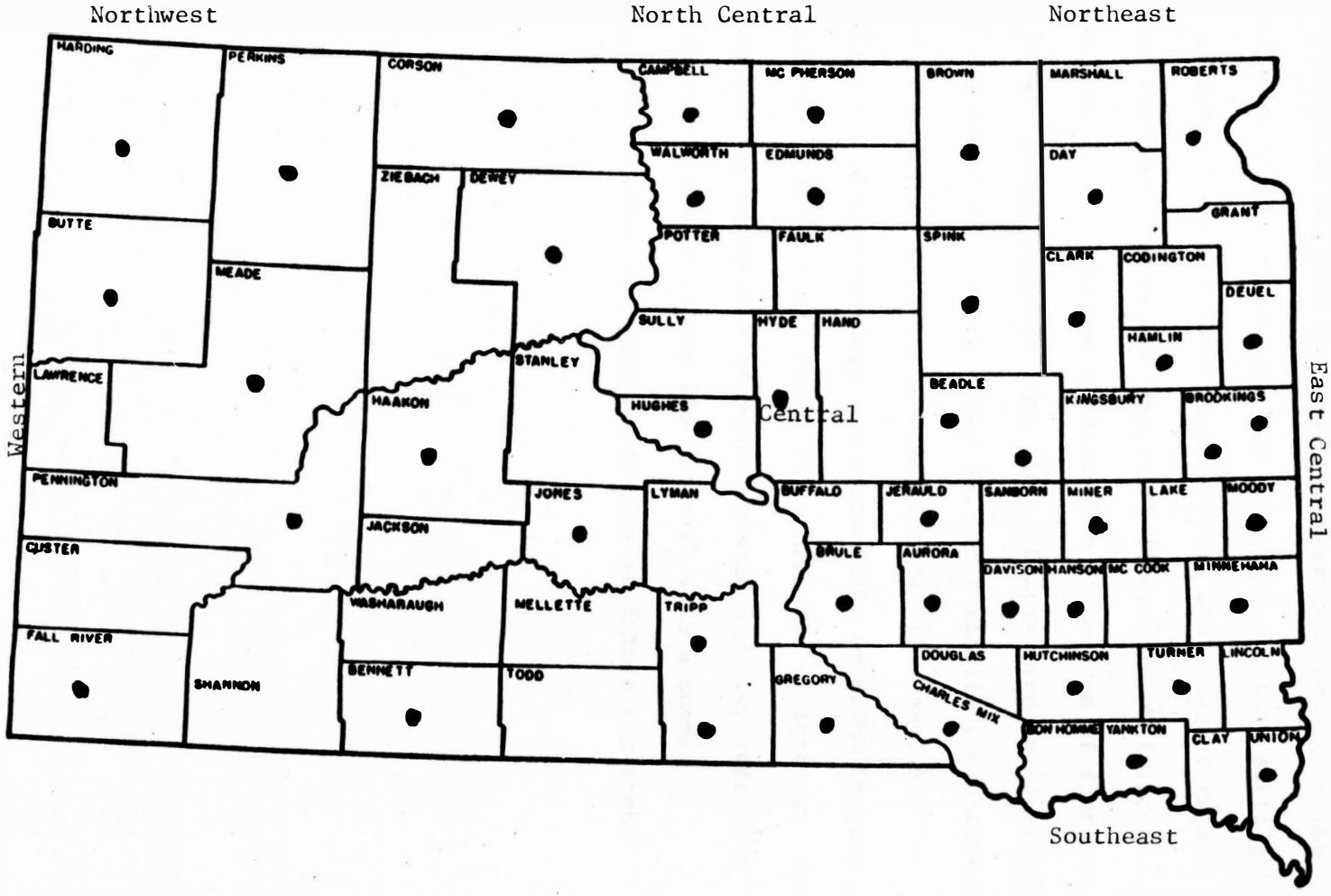
Data Source

Balance sheet category of repriceable assets and liabilities, quarterly average statements, and income statements for these banks were obtained from the Federal Reserve Bank of Minneapolis. The data were compiled for each year by obtaining the second quarter data from 1984-1986. The interest rate series was constructed from the information contained in the Federal Reserve Bulletin.

Organization of Study

The organization of this research is as follows: Chapter one contains the introduction, problem statement, research objectives,

Figure 1.1
Distribution of Sample Banks



outline of procedures and data sources. Chapter two focuses on the microeconomic theory of a financial firm (a bank), and also spotlights the effect of deregulation on bank profitability and interest rates. Chapter three includes a review of empirical literature on interest rate risk at commercial banks and a discussion of the use of financial futures to hedge against interest rate risk. Chapter four presents an analysis of the trend in interest rates and asset-liability management strategy and composition of banks by size. Chapter five analyzes the asset-liability management strategy and composition of banks by crop reporting district. Chapter six presents an analysis of interest rate risk exposure and gap management of banks by size and crop reporting district. Chapter seven concludes the research with a summary, implications, limitations, and recommendations on future research.

CHAPTER II

Microeconomic Theory of a Depository Firm

Economists and policymakers have expressed concern about the effect of deregulation on the banking industry because the regulatory framework of the industry has gone through several changes over the past fifteen years. (Santomero and Siegel, 1986) As a result of this, Santomero and Siegel point out, that there are mixed reviews from both consumers and the financial industry. Consumers have been charged the marginal cost of financial services, but have still increased their deposit rates; and on the industry level, "new-breed" financial firms have evolved, and competition for funds has increased. These have had the effect of eroding the profit margin in the industry.

This chapter focuses on the microeconomic theory of a depository firm through a simple model, and also the microeconomic effect of deregulation on bank profitability, interest rates and monetary policy.

The microeconomic behavior of a depository firm presented in this chapter is based on the analysis by Lewis J. Spellman, The Depository Firm and Industry, Chpt. 3, New York: Academic Press, 1982.

The model illustrates the behavior of a depository firm given certain conditions and assumptions about the fundamental relationships in the operation of a depository firm. These assumptions are: (1) that the motive of a depository firm is to maximize profit; (2)

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expectations of the future do not differ from those of the present; (3) certainty of availability of funds for continuous operation; (4) a single liability class (deposits); (5) the firm is a rate taker (meaning earning rates on assets are exogenous to the firm); (6) there are no taxes imposed on profits; (7) the firm is considered to operate in a single period, in this case one year. Given these assumptions, the model highlights the roles of competition and efficiency in determining deposit rates, rate spreads, profit margins, deposit size, and the depository firm's distribution of revenue.

The depository firm operates in an imperfectly competitive deposit market because of regulatory imposed limitations to entry, but its discretion to set deposit rates is not subject to regulatory ceilings. This, in effect, makes the funds supplied by the public interest elastic; i.e., as deposit rates increase, deposit levels also increase. Therefore, the deposit demand curve is upward sloping. The deposit level is a function of the deposit rate, the rate available on alternative market instruments, and income and wealth of the community or local market. This can be expressed as,

$$D = D(r, n, y, w);\ D_r, D_n, D_y > 0;\ D_w < 0 \qquad (1)$$

where

r = deposit rate
n = rate available on alternative investments
y, w = income and wealth of the community.

It is generally assumed that, with everything else constant, the deposit level increases with higher levels of income and wealth and decreases with higher market rates on alternative instruments. The

firm's demand for loans or securities (assets) does not increase security prices or reduce loan rates because rates on assets are exogenous to the firm due to its size relative to the loan and securities markets. In effect, the earning asset rate r_a cannot be influenced by the firm by increasing its earning assets in its portfolio. Therefore, the firm is a rate taker and quantity setter in asset markets. The revenue accruing to the firm is then equal to r_aD.

The annual production costs C of the firm is a function of deposits and earning assets. The firm also incurs costs for factor inputs and other intermediate products such as supplies in processing both earning assets and deposits. The production costs are assumed to depend on the stock levels of both deposits and earning assets since costs are incurred for both deposit gathering and management, as well as asset selection and management. Other costs that are reflected in the parameters of the annual production cost function are asset and liability maturities, and transfer services (if this is part of deposit cost). The production cost function is expressed as:

$$C = C(D) \qquad C'(D) > 0 \qquad (2)$$

The marginal production cost is assumed to be positive which signifies that the production cost function is upward sloping. The average production cost per deposit dollar per annum is C/D and is denoted c. The average production costs c, and the deposit and earning rates are all denominated in the same dimension. For simplification, it is assumed that marginal costs are constant and equal to average costs per deposit dollar. Therefore, $C'(D) = C/D = c$.

The firm is also subject to interest cost for deposits which accrue at an annual rate r. If deposit rates increase, deposit level will also increase. The firm's deposit costs per annum are rD. With the revenue and cost functions of the firm derived, and given the previous assumptions, a model is developed that will explain the roles of competition and efficiency in determining deposit rates, rate spreads, profit margins, deposit size, and a depository firm's distribution of income.

The Depository Rate, Rate Spreads, Profit Margins, and Deposit Size

The depository firm's profit is total revenue less components of total cost which can be denoted as:

$$P = r_a D - rD - C(D) \qquad (3)$$

where

$r_a D$ = total annual revenues
rD = annual interest costs
$C(D)$ = annual production costs.

The revenues and costs, as stated above, are an annual flow from deposit activity. By assumption, the firm is a rate taker in the asset market, and therefore maximizes profit with respect to deposit rate r being the only variable that can be controlled in a free deposit rate environment. Spellman explained that in determining profit maximizing deposit rates, the firm takes its deposit supply curve and production technology (presumably the most efficient available) in its local market as given. From the profit function, the profit maximizing deposit rate r can be determined by substituting the deposit function

into the profit function and differentiating with respect to r.

$$P = r_a D(r,n,y,w) - rD(r,n,y,w) - C(D(r,n,y,w))$$

$$P = r_a D_r - D_r - rD - C'(D)\, D_r \qquad (4)$$

Divide equation (4) through by D_r and rearrange terms to obtain

$$r = \left(\frac{Dr}{D} + r\right) + C'(D) \qquad (5)$$

= marginal deposit cost + marginal production cost

Equation (5) represents the deposit level that maximizes profit. This is equal to the added deposit cost $D(\partial r/\partial D)$ that results from paying a higher deposit rate $\partial r/\partial D$, and r the deposit rate of the marginal deposit dollar, with $\partial C/\partial D$ the marginal production cost. In order to attract additional deposits, the firm will have to pay higher deposit rates which increases the interest cost to the firm because it must pay for the marginal deposit at the rate r and also the higher deposit rate to all existing intramarginal deposits. By assumption, the added deposit costs will exceed the added revenues from an additional deposit dollar at some deposit size because the average (marginal) deposit cost is an increasing function of the deposit level.

To determine the profit maximizing deposit rate, one can solve equation (5) for r as an implicit mathematical function, because r cannot be mathematically reduced to a separate term. An assumption that the firm's deposit supply is characterized by a constant elasticity in r makes it possible to solve for r in equation (5) explicity.

$$\varepsilon = D_r * r/D > 0 \qquad (6)$$

$$r/\varepsilon = D(\partial r/\partial D) \qquad (7)$$

Substitute equation (7) into (5) to obtain

$$r = (r/\varepsilon + r) + C'(D) \qquad (8)$$

Now we can solve for r^*, the profit maximizing deposit rate:

$$r^* = \varepsilon/(1+\varepsilon)(r_a - C'(D)) \qquad (9)$$

The level of the profit maximizing deposit rate r^* depends on two terms; the net revenue per deposit dollar $(r_a - C'(D))$, and the deposit response $\varepsilon/(1+\varepsilon)$ which Spellman designated as the pass-through proportion. The marginal deposit response that triggers marginal increases in deposit cost and revenue is contained in the elasticity term rather than in the r_a term as stated in equation (5).

The deposit elasticity term is significant because the proportion of net revenues passed through to depositors depends on the pass through proportion $\varepsilon/(1+\varepsilon)$, which depends on the value of ε; and also the value of ε, assumed to be within the range of $(0,\infty)$, indicates the level of competition that prevails in the market, and in effect, the level of deposit rate that is paid by the firm. When elasticity is zero, there will be no deposit response to higher interest rates, and also no incentive to pay higher rates because this will add to cost but not revenue or profit. This situation corresponds to imperfect competition. At the other extreme of infinite deposit elasticity, increases in deposits overwhelm the depository firm when it raises deposit rates. This situation corresponds to perfect competition.

The deposit elasticity influences the share of revenues that pass through to depositors via the pass through proportion which has a range of 0 to 1. When the depositors' response to the deposit rate

is low $\varepsilon/(1+\varepsilon)$ will approach 0, and r^* will approach 0. But when the response to higher deposit rate is great, ε gets larger and deposit rates will get higher. If the deposit elasticity approaches infinity, a situation of perfect competition, $\varepsilon/(1+\varepsilon)$ will approach 1, and the deposit rate will approach net revenues $(r_a - C'D)$. This implies that as the firm's deposit demand become more elastic, the optimal deposit rate will increase and approach the net asset earning rate $(r_a - C'D)$. Thus, the effect of competition on deposit rates works through the elasticity of deposit demand in the local deposit market.

Rate spread of a depository firm is the difference between the rate earned on assets and rate paid on deposits. In this case the spread of the firm is $s=(r_a - r^*)$; and because the value of the elasticity affects the deposit rate, it also affects the spread s between asset and deposit rates. Substituting for r^*,

$$s = r_a - \varepsilon/(1+\varepsilon)\ (r_a - C'(D) = 1/(1+\varepsilon)*r_a + \varepsilon/(1+\varepsilon)*C'(D) \quad (10)$$

Equation (10) indicates that the rate spread also depends on both competition and efficiency as measured by the deposit elasticity and marginal costs respectively. When there is perfect competition, ε approaches infinity and the spread between the earning and deposit rates approaches the marginal production costs. The deposit rate approaches net revenue. At the margin, the extent to which higher earning rates and cost savings from greater technical efficiency are passed through to depositors depend upon deposit elasticity:

$$\partial r^*/\partial r_a = \varepsilon/(1+\varepsilon) \quad (11)$$

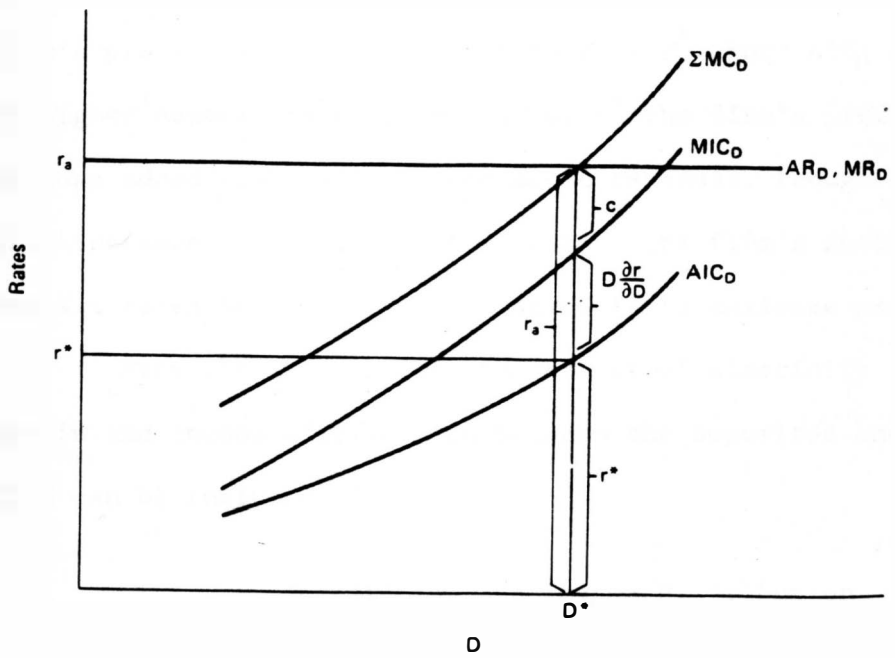
and

$$\partial r^{*} / \partial mc = - \varepsilon/(1 + \varepsilon) \qquad (12)$$

Equations (11) and (12) represent the change in deposit rate with respect to a one unit change in earning asset rates and marginal production costs respectively.

A graphical presentation of the model is illustrated in Figure 2.1. Figure 2.1 explains the behavior of the depository firm to maximize profit.

Figure 2.1 The Profit Maximizing Deposit Rate



The depository firm's deposit demand curve, $D = D(r,n,y,w)$, represent its average interest cost of a deposit AIC_D, which rises with higher levels of deposits D. As a result, the marginal interest cost curve per deposit MIC_D lies above the average interest cost AIC_D. From

the previous assumption, average production costs are equal to marginal production costs regardless of the level of deposits. When the marginal interest cost and marginal production costs are added, the sum of the marginal costs, ΣMC_D, is obtained. With the assumption that average revenues do not decline with deposits, the revenues per deposit dollar AR_D are perfectly elastic and represented by a horizontal line. Because average revenues are constant, marginal revenues MR_D are also constant and equal to average revenues. The point of intersection of ΣMC_D and MR_D gives the equilibrium deposit level D^*. At this level, the firm's profit maximizing deposit rate is r^* where AIC_D and D^* intersect. At higher deposit rates in excess of r^* the firm's profit is squeezed because added costs will exceed added revenues, though deposit levels will increase. Therefore, it is not in the firm's interest to increase deposit rates beyond r^* if its motive is to maximize profit.

From the above model, the effect of elasticity ε on profit margin and income distribution between the depositor and the depository firm can be analyzed.

Competition and Income Distribution

In order to determine the profit level from the deposit activity, the profit maximizing value of the deposit rate r^* can be substituted into equation (3), the profit function:

$$P = r_a * D - \{ \varepsilon/(1 + \varepsilon)(r_a - C'(D)) * D\} - C(D) \quad (13)$$

Equation (13) states that the total profit P depends on net revenues ($r_a - C'(D)$), deposit level D, the deposit rate elasticity ε and total

production costs C(D). Dividing equation (13) through by D, the profit margin or profit per deposit dollar p can be derived.

$$p = 1/(1 + \varepsilon)(r_a - c) \qquad (14)$$

From equations (9) and (14), with the assumed conditions, the net revenue to the depository firm is equal to the shares of income accruing to the depositor $(\varepsilon/(1 + \varepsilon))(r_a - c)$ and the equity position $1/(1 + \varepsilon)(r_a - c)$. That is,

$$r^* + p = r_a - c. \qquad (15)$$

Also, the ratio of the profit maximizing deposit rate r^* to the profit margin p is determined by the deposit elasticity $r^*/p = \varepsilon$. As the deposit elasticity increases, indicating a more competitive market, the greater will be the response of deposits to the deposit rate and therefore the greater will be the depositor's relative share.

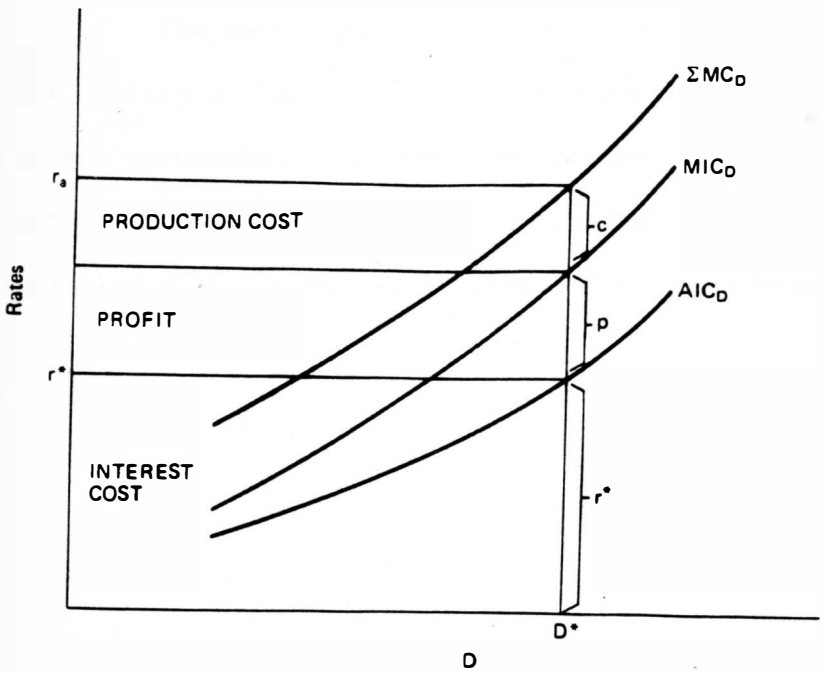
This analysis shows that the value of deposit elasticity ε is the critical determinant of revenue distribution. Furthermore, the value of ε can be measured in terms of interest rates and deposit production cost:

$$r^* = [\varepsilon/(1 + \varepsilon)](r_a - C)$$

$$r^*/(r_a - r^* - C) = \varepsilon$$

The graphical illustration of revenue distribution is presented in Figure 2.2.

Figure 2.2 Revenue Distribution



Total revenue is the area $r_a D$. Interest cost on deposits is the area $r^* D$; and production cost incurred from both deposit gathering and management and asset selection and management is the area CD. By equation (15) the remaining revenue pD accrues to equity position.

Conclusion

The model has examined the microeconomic behavior of a depository firm under simplying assumptions about market structure and

production costs. The analysis of deposit rates, rate spreads, profit margins and income distribution, show that deposit elasticity, the responsiveness of deposit levels to interest rates paid on deposits, is critical to understanding the relationships between these variables.

The model, given the assumptions and conditions that prevail, is clearly a simplification of the real world situation. Relaxing these assumptions and conditions result in a more complicated model that explains in greater detail the behavior of a depository firm but retains the essential properties of the simple model.

Microeconomic Effect of Deregulation on Bank Interest Rates and Profitability

The process of financial deregulation has caused the regulatory framework and the structure of financial insitutions to undergo changes that have been broad and pervasive. (Santomero and Siegel, 1986) The purposes of deregulating the financial industry was to increase competition and give the Federal Reserve broader control over the monetary aggregates, and thus provide greater stability to the U.S. economy. These objectives led to the enactment of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) of 1980 by Congress. Through this Act, Timberlake (1985) observed that the restriction on freedom of economic activity of the banking and financial system has been significantly relaxed, and the power of the Federal Reserve greatly increased.

As a follow-up to the illustration of the behaviour of a banking firm in the first part of this chapter, the second part will attempt to spotlight the effects of deregulation on interest rates and profitability of a bank.

The Effect of Deregulation on Interest Rates

One aspect of the DIDMCA of 1980 was to remove the deposit rate as a central bank control variable. This implies that all deposit rates (except demand deposits) are market determined and free of

interest rate ceilings. Santomero and Siegel note that this type of deregulation increases the level of deposit rates and also the sensitivity of such deposit rates to the market rate of interest. There are two competing ways presented by Santomero and Siegel of looking at the effects of deregulation of deposit rates on bank behavior. These assumptions are: (1) that there is only a single market rate; and (2) that there is more than one market rate. [Hancock (1985) also made use of these assumptions in her study].

The first assumption centers around the view that all bank activities and services are a function of one market interest rate. Hancock noted that the first assumption is appropriate only if assets and liabilities can be aggregated, with price per unit of services equal to the market interest rate; and there is no adjustment for differences in liquidity, risk, and maturity between various assets and liabilities. Therefore, a bank in this case can make implicit payments to depositors as a simple enhancement of explicit deposit rates. Deregulation is irrelevant in this respect if (1) implicit payments are produced efficiently; (2) explicit and implicit payments are valued in exactly the same manner; and (3) there is sufficient quantity of implicit payments produced to circumvent the regulatory constraint. If the above conditions hold, a bank may be encouraged to make implicit payments not only to circumvent regulatory constraints, but also because of the nontaxable nature of implicit returns (Santomero and Siegel).

However, if the above conditions are not satisfied,

deregulation will have significant effects upon the deposit market and also increase the perceived deposit rate.

The second assumption centers around the view that deposit deregulation is very complex, and that bank activities and services are not a function of a single market rate. In this framework, implicit payments to depositors are achieved through subsidization of transactions and transfers such as free checking and low cost automatic transfers. Increases in the explicit rate on deposits cause a change in transaction subsidies, but these do not translate simply into increasing or decreasing demands for deposits. In general, transaction subsidies decline as deposit rate ceilings increase, thereby resulting in an increase in the cost of transaction balances and a decline in transactions deposits in the banking sector. Santomero and Siegle concluded that the impact of deposit deregulation at the bank level is less than obvious. If regulation is ineffective, deregulation can be expected to have little aggregate impact; but if regulation leads to subsidies at the transactions level, deregulation's effect can only be deduced. However, Santomero and Siegel observed that the profession seems driven to the conclusion that deposit deregulation ought to increase deposit attractiveness. The implications of deregulation on deposit rates can be illustrated through a micromodel. The underlying assumption in developing the model was that bank services are not a function of a single market rate.

The effective deposit rate r_D, which is the sum of the implicit and explicit interest paid on deposits, can be stated as follows:

$$r_D = f(\overset{+}{r},\ \overset{+}{r_o},\ \overset{-}{k_D},\ \overset{+}{r_r},\ \overset{-}{\phi}) \qquad (1)$$

where

- r = market rate of interest
- r_o = the government mandated ceiling for the explicit rates paid on deposits
- k_D = effective reserve ratio on deposits
- r_r = rate of return (if any) paid by the central bank on required reserves
- ϕ = the variable that measures the effectiveness of regulation enforcing the deposit ceiling.

The signs over the arguments refer to the sign of the partial derivatives. The market rate of interest r, explicit deposit rate r_o, and the rate of return on reserves positively influence the effective deposit rate r_D; while the reserve ratio k_D and state of regulation ϕ negatively influence the deposit rate.

A depository firm will choose an effective reserve ratio k_D based on its profit maximizing decisions and mandatory reserve ratio. k_D can be expressed in the functional form:

$$k_D = g(\overset{-}{r},\ \overset{+}{k_o},\ \overset{+}{r_r}) \qquad (2)$$

where k_o is the explicit required reserve ratio on deposits. The above function is a micromodel of reserve determination. From the above discussion, a specific form of the function r_D was derived which illustrates the effects of deposit deregulation. This is defined as:

$$r_D = (1 - \phi)[(1 - k_D)r + k_o r_r - \psi] + \phi r_o \qquad (3)$$

where ψ is the marginal cost of producing deposits. If $\phi = 0$, which implies rate ceilings on deposits are totally ineffective, then r_D is equal to $[(1 - k_D)r + k_o r_r - \psi]$ ---a weighted average of the market rate of interest and the interest paid on reserves less the marginal

costs of producing deposits. But if $\phi = 1$, when regulation is totally effective, then $r_D = r_o$. In this respect the effective deposit rate is equal to the deposit ceiling. One of the objectives of deregulation is to eliminate rate ceilings on deposit rates. This corresponds to the condition where $\phi = 0$.

Differentiating equation (3) with respect to the market rate of interest, gives:

$$dr_D/dr = (1 - \phi)[(1 - k_D) + k_o\, dr_r/dr] \qquad (4)$$

Equation (4) indicates the increase in the interest sensitivity of the effective deposit rates due to deposit rate deregulation. The terms in brackets are non-negative, therefore dr_D/dr is a decreasing function of the state of regulations as indicated by ϕ. When $dr_D/dr = 0$, then regulation of deposit rates is completely effective ($\phi = 1$), but when $dr_D/dr = 1$ then there is no deposit regulation. In this case deposit deregulation has been totally achieved. Obviously, a shift from deposit rate regulation to no regulation will have an effect on profitability.

The Effect of Deregulation on Bank Profitability

Since deregulation of the financial institution has resulted in increased competition, excess profits generally must have declined. But Flannery (1980) noted that because bank costs and revenues both respond to increases (decreases) in market rates, the net effect on bank profits due to deregulation is hard to predict--banks are not in danger of failing, nor do they reap windfalls when market rates change.

Flannery observed profits go up or down depending largely on the average maturity of bank assets and liabilities.

If a bank's portfolio is unbalanced, there is greater opportunity for profits, and likewise greater prospects of a loss. The composition of a bank's portfolio is based on the expectations of the portfolio manager. If it is expected that interest rates will rise, then the bank should issue liabilities with an average maturity exceeding its average asset maturity. If interest rates rise, interest costs will rise more slowly than revenues because liability rates are locked in, and the bank will earn a handsome profit until its cheap liabilities must be rolled over. But if interest rates fall, contrary to expectation, asset returns would decline more promptly than liability costs and the bank will show poor earnings.

Market rate changes due to deregulation can have two effects on a bank's profit. The short-run effect induced by the relative maturities of the asset and liability portfolios; and the long-run effect is permanent portfolio revisions that can raise or lower profits.

While the effects of deregulation on interest rates and profitability at the microbank level are hard to predict, rates and profits have been more volatile since DIDMCA. This implies greater risk for banks and depositors.

CHAPTER III

Literature Review

This chapter presents the results of previous studies on interest rate risk management at commercial banks and also discusses the use of tools that have been developed to hedge against interest rate risk.

Interest rate variability has been a major concern to financial institutions since the mid-1970s. The risk of returns to income and investment associated with the volatility of interest rates has been studied extensively. Most empirical studies, Flannery (1981, 1983), Graddy and Karna (1984), Hanweck and Kilcollin (1984), and Mitchell (1985) concluded that banks are not significantly exposed to interest rate fluctuations--especially the large banks.

Though banks in the aggregate may not be exposed to interest rate risk, banks located in certain environments may be facing greater risk of interest rate volatility--especially those located in the oil and agricultural producing regions. Francis (1978) concluded that "many of the differences between the average small-, medium- and large sized banks result from the different environments in which they operate instead of explicitly different management policies". (p.478) Brewer and Lee (1986) also note that a bank may be more sensitive to certain kinds of risk depending on its part of the country.

This study focuses on the risk exposure faced by commercial banks in South Dakota given the predominant rural agricultural economy in which they operate. Since most studies report that banks in the aggregate are well hedged against interest rate risk, the review of literature presented will also focus on research methodology and models used in these studies. But first, an explanation of the tools, "gap" and "duration gap", used by banks to measure the extent of interest rate risk will be presented.

The Gap

Gap management is a tool used by banks to insulate net income from interest rate risk. Mitchell (1985) defined gap as rate sensitive assets less rate sensitive liabilities and explains that net interest income is fully insulated from interest rate risk when gap is set equal to zero. Simonson et al. (1982) stated that gap management has been widely promoted as a tool that commercial banks and similar institutions can use to improve their performance.

The basic gap model can be stated as: Gap = RSA-RSL. Rate sensitive assets (RSA) and rate sensitive liabilities (RSL) are those that can undergo contractual changes in interest rates during the gapping period. Toevs (1983) suggested that for a bank to implement gap management, it must supply four pieces of information: (1) the length of time (gapping period) over which net interest income is to be managed--usually one year is chosen for this period; (2) whether the bank will maintain the currently expected net interest income for the

gapping period or attempt to better it; (3) an interest rate forecast for the gapping period; and (4) the bank must decide on the dollar amounts of the rate sensitive assets and liabilities.

If a bank wishes to insulate net interest income from changes in interest rates, then it can set its gap equal to zero. But if a bank intends to be more aggressive and place net income at risk, then a mismatch between RSA and RSL is required. The direction of this desired mismatch depends on the interest rate forecast. If rates are expected to rise, net interest income (NII) can be enhanced (should the rate forecast come to pass) by setting gap greater than zero. In this case, more assets than liabilities shift into higher earning accounts during the gapping period. As a result, the NII realized exceeds the NII that would have been earned had either rates not increased or gap been set to zero. Likewise, if interest rates are expected to decline an active gap position will require setting gap less than zero.

Duration Gap

Duration gap is a more complex tool. It is defined as a measure of the average life of a security and used in management to insulate net worth from unexpected interest rate movement. Net worth is the market value of assets minus the market value of liabilities. This can be immunized completely against unexpected interest rate changes by choosing a duration gap of zero. A simple duration model is (Kaufman, 1984):

$$D = \frac{\sum_{t=1}^{T} t*PVF_t}{\sum_{t=1}^{T} PVF_t}$$

where

D = Duration
t = length of time (number of months, years, etc.) to the date of payment
T = longest maturity
PVF = present value of the payment (F) made at (t), or $F/(1+i)^t$
Σ = summation from the first to the last payment.

The major difference between gap and duration gap is that gap management is used to insulate net income from interest rate changes, while duration gap management is used to insulate net worth from unexpected changes in interest rates. Duration gap analysis, though a more accurate and desirable method of risk management (depending on a bank's portfolio composition, size and management goals), has costly data demands. Active duration gap management strategy is analogous to that of gap management. If a bank expects interest rates to rise, then duration gap should be negative; i.e., the average duration of the assets should be shorter than that of the liabilities. A bank position in this situation will cause the value of net worth to increase as interest rates rise. In essence, if rates are expected to decline, a bank would be better off if duration gap were positive, which makes it behave like a net asset. Then, bank value increases as interest rates decline.

Kaufman noted that most banks do not wish to eliminate interest

rate risk altogether but prefer to manage it. Gap and duration gap have been used as the basis of models developed by some researchers in evaluating the effects of interest rate changes on bank income and net worth, or to measure the degree of risk exposure.

The general notion that commercial banks borrow short and lend long denotes that sharp market rate increases may result in bank failures. Flannery (1981) developed a method for estimating average asset and liability maturities for a sample of large money center banks. The major concern of the study was how large and long lasting were the market rate effects on intermediary revenue and cost streams.

Regression models were developed and tested to determine if market rate fluctuations have a significant impact on bank profitability. Results obtained indicate that large banks were effectively hedged against market rate risk by structuring asset and liability portfolios with similar average maturities.

Flannery's study used a sample of fifteen large banking organizations with average assets of $35 billion at the end of 1978. Individual bank assets ranged from $2.5 billion to $94.9 billion. Annual accounting data on each bank were obtained from Compustat for the sample period 1959-78.

Because of the difficulty in calculating the duration of assets and liabilities from the available accounting data, Flannery assumed that accounting revenues (costs) respond to changes in market conditions with a lag that reflects the average maturity of the underlying asset (liability) portfolio.

Based on this assumption, a regression specification model was derived which differentiates between the return on net new earning assets (which should fully reflect current market rates) and the gradual reinvestment of previously allocated assets whose nominal returns reflect past market conditions. Regression specifications were derived for the gross operating income (GOI), total operating expenses (TOE), and net current operating earnings (NCOE). These regression specifications, according to Flannery, had two important characteristics: (1) the adjustment speed (which reflects bank and customer optimizing behavior) is constant through time; and (2) the specifications are linear because some revenues and costs are insensitive to market rates.

These specifications were estimated simultaneously for each bank using Zellner's seemingly unrelated method. This method was used because it generates covariances between coefficient estimates in different equations, allowing more accurate comparisons of the revenue and cost adjustments to market rate changes.

Flannery (1983) employed similar models and methodology to evaluate the effect of interest changes on the profitability of small commercial banks. Twelve banks were chosen at random from the national population for each of five asset size categories (based on year end 1978 assets): less than $25 million, $25-$49.9 million, $50-$99.9 million, $100-$299.9 million, and greater than $300 million. Annual data on each bank was obtained from the Federal Reports of Income and Condition for the sample period 1960-78. The empirical results

indicate that banks as a group are not exposed to substantial interest rate risk. Both studies suggest that banks (small and large) were able to neutralize the effect of interest rate risk on bank profitability. The sample periods examined in these studies were periods with relatively stable interest rates.

Hanweck and Kilcollin (1984) examined the issue of interest rate sensitivity of commercial bank profitability during a period of rising interest rates (1976-81). This study was concerned with the assertion that the profitability of banks that lend long and borrow short is restricted during periods of rising rates. Results obtained indicate that small commercial banks as a group have actually experienced increased profitability both absolutely and relatively to large banks in periods of rising interest rates (since 1976). Hanweck and Kilcollin stated that the results from their study call into question the usefulness of maturity composition models as a predictor of interest rate risk, and also the concern for the plight of small banks during periods of high and rising interest rates.

The methodology and model developed in the study by Hanweck and Kilcollin differs from the studies by Flannery (1981,1983). Instead of using a maturity composition model, Hanweck and Kilcollin derived a reduced form equation in which net interest margin (NIM), defined as interest income minus interest expense divided by earning assets, was a function of current and past market interest rates. Such a model was employed because only the effect of exogenous interest rate changes on current bank NIM was of direct concern in this study. The estimated

coefficients of a regression of NIM on interest rate levels express the net effect of changing market interest rates on NIM.

The data on three bank class sizes, (less than $100 million, $100 million to $1 billion, and greater than $1 billion), were obtained from the Reports of Condition and Income filled by all insured commercial banks on a quarterly basis for large banks (those with assets greater than $300 million), and on a semiannual basis for other banks from 1976-81.

A similar study was conducted by Graddy and Karna (1984) which examined the response of bank net interest margin and sensitivity ratio to changes in the level and volatility of market interest rates for the period 1975-80. They reported that there was a weak positive relationship between interest rates and net interest margins of large banks, but a stronger positive relationship for smaller banks. Their findings were similar to those of Hanweck and Kilcollin (1984).

The model employed in the study by Graddy and Karna was based on the interrelationship between asset-liability structure (maturity composition concept) and net interest margin. This study focused on 98 sample banks in the Seventh Federal Reserve District with asset size in the range of $26 million to over $1 billion. These banks were grouped into four categories: $25-$50 million, $50-$100 million, $100-$300 million, and over $300 million. Regression estimates were derived for each group using the two-stage least squares (2SLS) procedure.

Despite the differences in the model and methodology adopted in the study by Graddy and Karna, compared to the study by Hanweck and

Kilcollin, similar results were obtained. There are some important observations of the studies presented so far. The sample periods in the studies by Flannery were relatively stable periods (before the change in the financial market environment), while the studies of Graddy and Karna, and Hanweck and Kilcollin used some post 1979 data. There was too little to test formally how the changed environment had affected the exposure of banks to interest rate risk. These studies focused on the risk of net interest income loss due to fluctuations of interest rates. These were some criticisms by Mitchell (1985) of these empirical studies.

Mitchell proceeded to investigate "how well--or how poor--" commercial banks adapted to the more volatile financial environment after deregulation. The major findings of this study were that: (1) all categories of banks (small, medium and large) changed their portfolio strategies in response to the more volatile financial environment, but only large banks succeeded in reducing interest rate risk; and (2) interest rate risk was present to different degrees at all size categories, but the total amount of risk was probably small.

Mitchell developed the two-portfolio two-component model based on asset-liability maturity composition to estimate the exposure of net interest income and net worth to interest rate risk. In the two-component two-portfolio model, bank asset-liability management reduces to two types of decisions: (1) decisions about the distribution of each portfolio between the short-term and long-term components; and (2) decisions about the composition of the long-term components.

To test empirically the exposure of banks to interest rate risk using this model, relationships between observed decision variables and unobserved variables were assumed. Estimation of the model yields estimates of the exposure of banks to both components of interest rate risk.

Data was obtained from the Reports of Income and Condition filed by banks in the Tenth Federal Reserve District for the period 1976-83. These banks were grouped into three asset size categories: less than $100 million, $100-$300 million, and greater than $300 million.

The results from this study corroborated the findings of other researchers; i.e., banks of all sizes were not significantly exposed to interest risk even when allowance was made for the changes in portfolio management in the more volatile financial market environment after the switch to the new Federal Reserve operating procedures and the acceleration of deregulation.

Because of the implications of interest rate volatility, some banks (mostly large banks) participate in the financial futures market to hedge against interest rate risk. The rest of this chapter will present a discussion on the use of the futures market. The following questions will be addressed: why use financial futures, how is it used and what are the advantages?

The Use of Financial Futures

Futures are temporary risk management tools to assist in the restructuring of a bank's portfolio.(Koppenhauer, 1984) When assets and liabilities can not be restructured to achieve a zero duration gap or zero gap, or a desired risk position, financial futures become a useful tool. (Mitchell, 1985) Therefore, the use of financial futures allows a bank to eliminate its exposure to interest rate risk. This is done by hedging in the futures market. In the futures market, a bank can hedge exposed asset and liability positions, in effect transferring the risk of commodity price changes to speculators who are willing to take the risk.(Brewer, 1985)

A financial futures contract is an accord between two parties to trade cash for an interest bearing financial instrument on a future date at a price determined when the accord was made. Mitchell explained that:

> financial futures insulate a bank from interest rate changes by offsetting a potential loss(gain) of net interest income or net worth with a potential gain(loss) from futures trading. By agreeing on a price in advance, both parties to a financial futures contract wager a bet on interest rate movements between the agreement date and delivery date. This gambling aspect of futures markets allows bankers to reduce interest rate risk. (p.10)

To reduce this risk, a manager should apply a hedge which in the limit reduces the interest elasticity of the portfolio to zero. There are different methods and types of hedging. But generally, hedging involves assuming a position in the futures market that is equal and opposite to a current or planned future position in the spot

or cash market. See Belongia and Santoni (1985), and Brewer (1985) on examples of how to hedge.

The advantage of futures market hedging, according to Koppenhauer, is that "basis" risk is frequently less than interest rate risk, and this risk substitution can be achieved at low transaction costs. Basis is the price or yield difference between a futures contract and the cash instrument being hedged.

Booth et al. (1984) noted that despite the academic excitement with futures and the argued advantages of using futures, financial institutions have been relatively slow to adopt futures programs--especially smaller banks. This is because the costs of learning, obtaining information, and efficiently using these tools are too great for the benefits available to a number of banks.

Conclusion

Empirical studies by various researchers indicate that banks as a group are not significantly exposed to interest rate risk before and after deregulation. This suggests that management strategies and the local environment in which a bank operates had played a significant role in the bank failures of the 1980s.

CHAPTER IV

Analysis of Asset-Liability Management / Composition of Banks by Asset Size

How well did banks in South Dakota cope with changes in market interest rates from 1984-86? This question can be addressed by evaluating the trend in market rates, asset-liability management strategy and asset-liability composition, and the income statements of banks during this period. Banks were grouped into four size classes based on total assets reported for the second quarter of each year, from 1984 to 1986. The asset size groups were: less than $10 million, $10-$25 million, $25-$50 million, and greater than $50 million.

As stated in the latter part of chapter three, asset-liability management strategy adopted by a bank depends on the preference of bank managers based on management policies, personnel training, bank size, cost of information, and the implementation and efficiency of strategy. An important function performed by an asset-liability manager is forecasting the movement of interest rates. Forecasting is important in order to sucessfully minimize the risk from unexpected changes in market interest rates. The forecast of interest rate movements is based on expectations of future economic activity.

Interest Rate Trend: 1984-86

This section analyzes the movement and volatility of market interest rates from January 1984 to December 1986. The market rates observed are: federal funds rate, U.S. Treasury bills (3-month, 6-month, and 1-year), and U.S. Treasury notes and bonds (2-year, 3-year, 5-year, and 7-year). These rates represent nominal risk free market rates at any time. Treasury securities represent no risk of default or illiquidity because of the government's ability to either tax or create money to meet maturity debt obligations and the existence of a large active secondary market in government securities. The federal funds market, while it does not represent risk free government debt, is an overnight interbank loan market which is virtually risk free and is the best approximation to a risk free rate on instantly repriceable debt. Weekly data of each quarter from 1984 to 1986 for the market rates were obtained from the Federal Reserve bulletin.

Table 4.1 shows the averages of these rates by quarter from 1984 to 1986. Generally, rates increased from the first quarter of 1984 through the third quarter of the same year. After the third, quarter rates continued to decline steadily each quarter throughout the remaining periods. This observation is illustrated in figures 4.1 and 4.2 which show the trend of each market rate during the 1984 to 1986 period. The general decline of rates was presumably to be the result of increased competition due to deregulation, policies adopted by the Federal Reserve causing a decline in inflation expectations and the

Table 4.1 Averages of Interest Rates by Quarter, January 1984 to December 1986

Year	Federal Funds	U.S. Treasury bills 3m	6m	1yr	U.S. Treasury notes & bonds 2yr	3yr	5yr	7yr
				Quarter 1				
1984	9.69	9.17	9.29	9.32	10.92	11.19	11.65	11.86
1985	8.47	8.16	8.42	8.64	10.26	10.67	11.19	11.50
1986	7.92	6.91	6.96	6.98	7.80	7.97	8.20	8.47
				Quarter 2				
1984	10.53	9.80	10.22	10.49	12.37	12.65	13.02	13.16
1985	7.96	7.48	7.68	7.87	9.41	9.78	10.33	10.73
1986	6.94	6.14	6.18	6.21	6.98	7.18	7.40	7.52
				Quarter 3				
1984	11.38	10.32	10.54	10.72	12.52	12.65	12.85	12.92
1985	7.89	7.10	7.26	7.43	8.89	9.28	9.77	10.19
1986	6.26	5.54	5.60	5.67	6.46	6.67	6.93	7.17
				Quarter 4				
1984	9.38	8.91	9.02	9.21	10.85	11.14	11.51	17.72
1985	8.05	7.17	7.26	7.32	8.55	8.87	9.26	9.65
1986	6.03	5.34	5.40	5.47	6.28	6.49	6.76	7.11

FIGURE 4.1

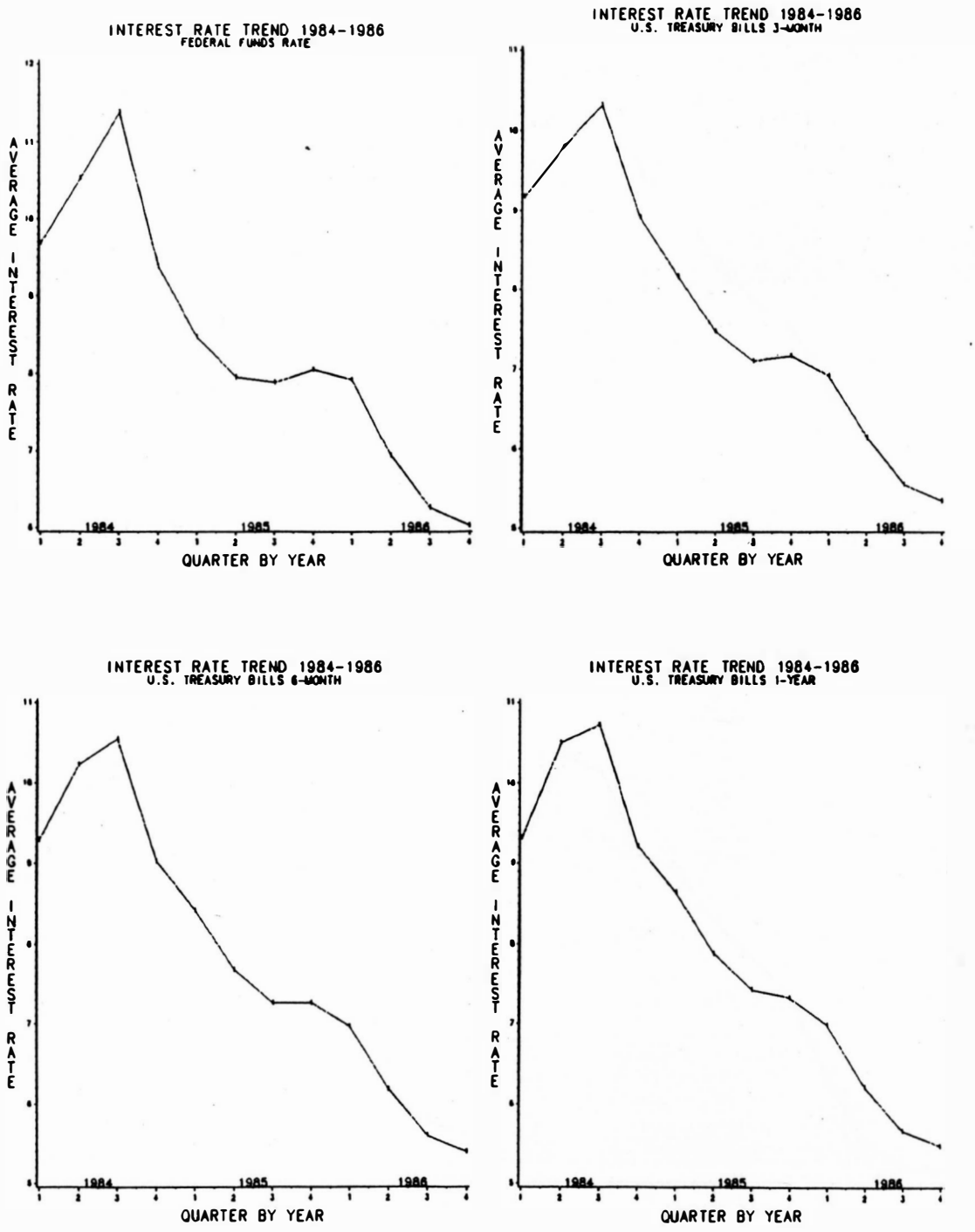
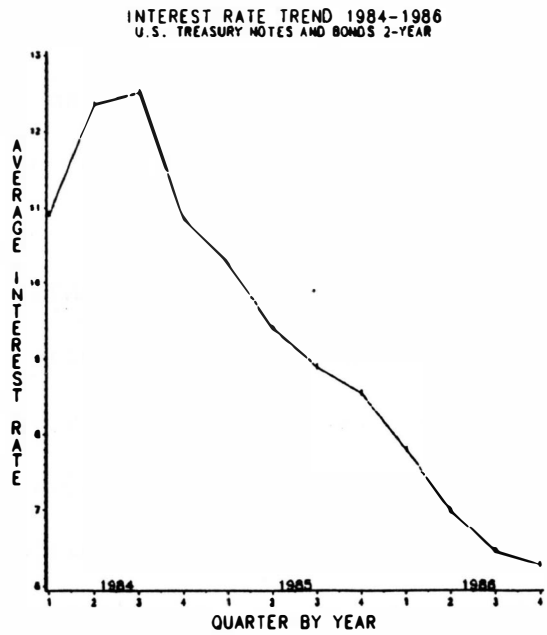
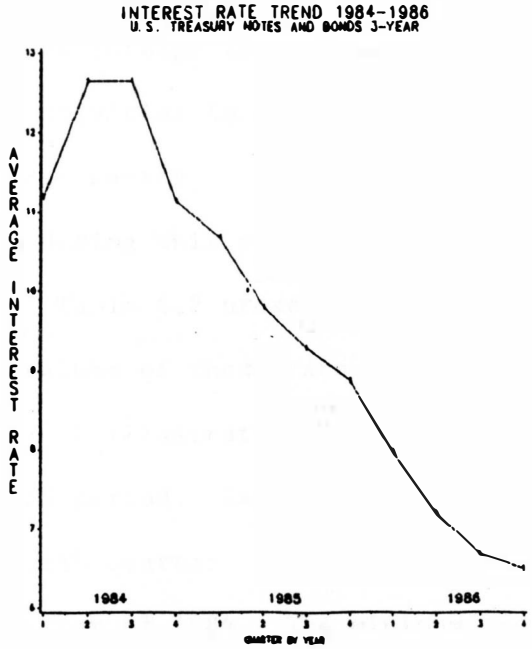
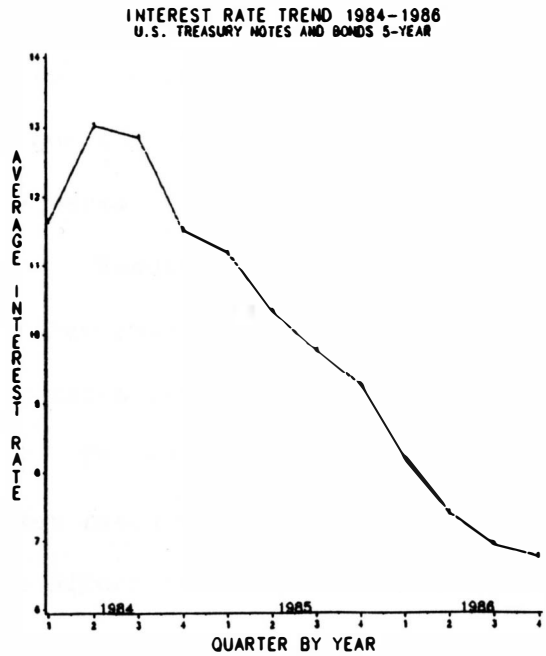
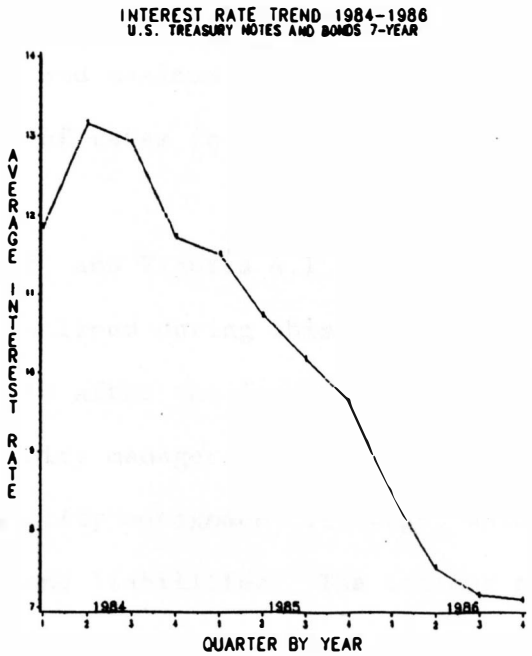

INTEREST RATE TREND 1984-1986
FEDERAL FUNDS RATE
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE TREND 1984-1986
U.S. TREASURY BILLS 3-MONTH
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE TREND 1984-1986
U.S. TREASURY BILLS 6-MONTH
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE TREND 1984-1986
U.S. TREASURY BILLS 1-YEAR
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR

FIGURE 4.2


INTEREST RATE TREND 1984-1986
U.S. TREASURY NOTES AND BONDS 2-YEAR
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR


INTEREST RATE TREND 1984-1986
U.S. TREASURY NOTES AND BONDS 3-YEAR
AVERAGE INTEREST RATE
1984
1985
1986


INTEREST RATE TREND 1984-1986
U.S. TREASURY NOTES AND BONDS 5-YEAR
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR


INTEREST RATE TREND 1984-1986
U.S. TREASURY NOTES AND BONDS 7-YEAR
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR

inflation premium that was earlier incorporated in market rates, and increased purchases of U.S. securities by foreign investors. The decline is also attributed to general activities in the economy and low demand of investment funds by the private sector.

The volatility of market rates during this period is gauged by the standard deviation of these rates. Table 4.2 presents the standard deviation and the minimum and maximum values of these rates for each quarter from 1984-86. Figures 4.3 and 4.4 illustrates the volatility of market rates during the 1984 to 1986 period. Rates were more volatile in 1984, especially in the fourth quarter. Short term rates were less volatile after the fourth quarter of 1984. The minimum and maximum values of rates in Table 4.2 serve as indicators of why the volatility of rates are relatively low or high in any quarter. The greater the spread between the minimum and maximum values of rates in any quarter, the higher the volatility of rates in that quarter, and vice versa.

Results from Tables 4.1 and 4.2, and Figures 4.1, 4.2, 4.3, and 4.4 show that market rates generally declined during this period, and that rates were relatively less volatile after the fourth quarter of 1984. The expectations of asset-liability managers of the movements of market rates will determine asset-liability management strategy, which will affect the composition of assets and liabilities. The concept of the expectations hypothesis can be used to explain the term structure of interest rates.

Table 4.2 Standard Deviation, and the Minimum and Maximum Values of Interest Rates by Quarter, 1984-86

	Federal Funds Rate			U.S. Treasury Bills									U.S. Treasury Notes and Bonds										
				3 month			6 month			1 year			2 year			3year			5year					
Year	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max	Sd	Min	Max
											Quarter 1													
1984	0.21	9.40	10.06	0.30	8.88	9.76	0.32	8.95	9.88	0.31	9.00	9.90	0.34	10.56	11.54	0.33	10.86	11.80	0.32	11.29	12.20	0.32	11.50	12.40
1985	0.18	8.19	8.75	0.35	7.65	8.69	0.40	7.91	8.97	0.33	8.22	9.15	0.37	9.79	10.81	0.31	10.25	11.13	0.30	10.70	11.60	0.30	11.02	11.90
1986	0.55	7.25	9.55	0.26	6.39	7.17	0.28	6.42	7.26	0.28	6.46	7.32	0.42	7.10	8.27	0.49	7.19	8.57	0.54	7.36	8.86	0.60	7.52	9.18
											Quarter 2													
1984	0.48	9.75	11.49	0.10	9.64	9.97	0.31	9.79	10.56	0.45	9.82	11.09	0.57	11.55	13.15	0.56	11.84	13.46	0.53	12.24	13.72	0.50	12.41	13.82
1985	0.46	7.13	8.68	0.46	6.81	8.17	0.53	6.97	8.58	0.54	7.14	8.79	0.64	8.55	10.49	0.66	8.90	10.84	0.65	9.45	11.33	0.59	9.93	11.64
1986	0.15	6.82	7.39	0.15	5.84	6.48	0.16	5.87	6.48	0.18	5.85	6.55	0.29	6.47	7.49	0.32	6.59	7.74	0.36	6.80	8.02	0.36	6.92	8.16
											Quarter 3													
1984	0.31	10.73	11.77	0.21	9.92	10.65	0.12	10.34	10.75	0.20	10.37	11.01	0.33	12.04	13.12	0.37	12.19	13.38	0.38	12.34	13.67	0.39	12.42	13.77
1985	0.13	7.64	8.07	0.12	6.89	7.28	0.16	6.98	7.44	0.15	7.13	7.62	0.17	8.58	9.11	0.19	8.96	9.51	0.17	9.50	10.01	0.16	9.97	10.45
1986	0.40	5.81	7.02	0.29	5.18	5.97	0.25	5.26	5.93	0.23	5.35	5.98	0.23	6.05	6.78	0.23	6.25	6.99	0.20	6.55	7.21	0.18	6.81	7.38
											Quarter 4													
1984	0.90	7.95	11.20	0.82	7.67	10.19	0.75	8.03	10.30	0.64	8.37	10.35	0.68	9.94	12.03	0.63	10.32	12.26	0.50	10.90	12.46	0.41	11.31	12.56
1985	0.20	7.71	8.49	0.09	7.01	7.29	0.11	7.06	7.38	0.14	7.07	7.49	0.33	8.00	8.96	0.39	8.23	9.35	0.43	8.54	9.82	0.45	8.91	10.26
1986	0.18	5.75	6.31	0.16	5.05	5.57	0.14	5.10	5.60	0.08	5.27	5.59	0.07	6.14	6.37	0.10	6.37	6.66	0.11	6.61	6.93	0.15	6.93	7.35

FIGURE 4.3

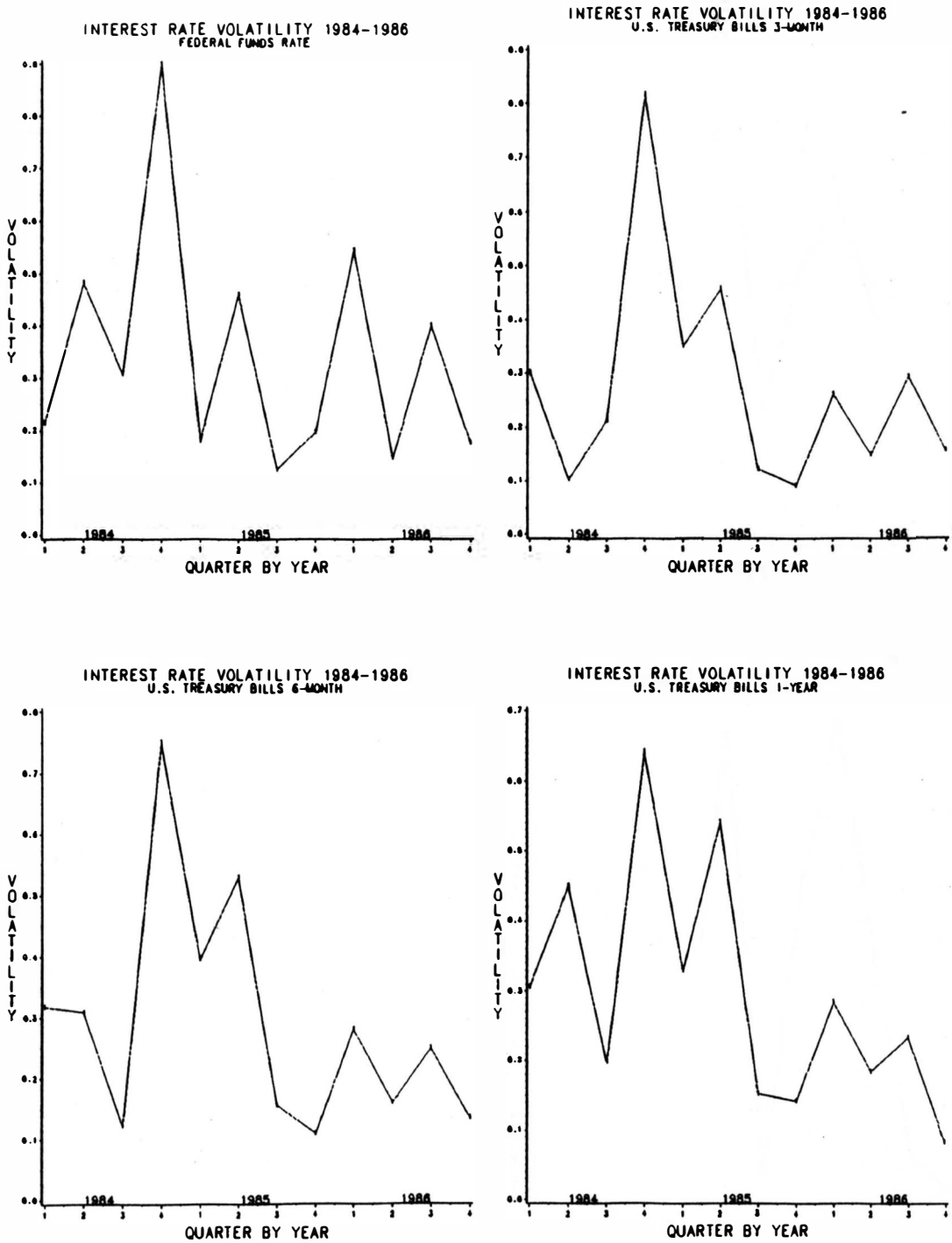
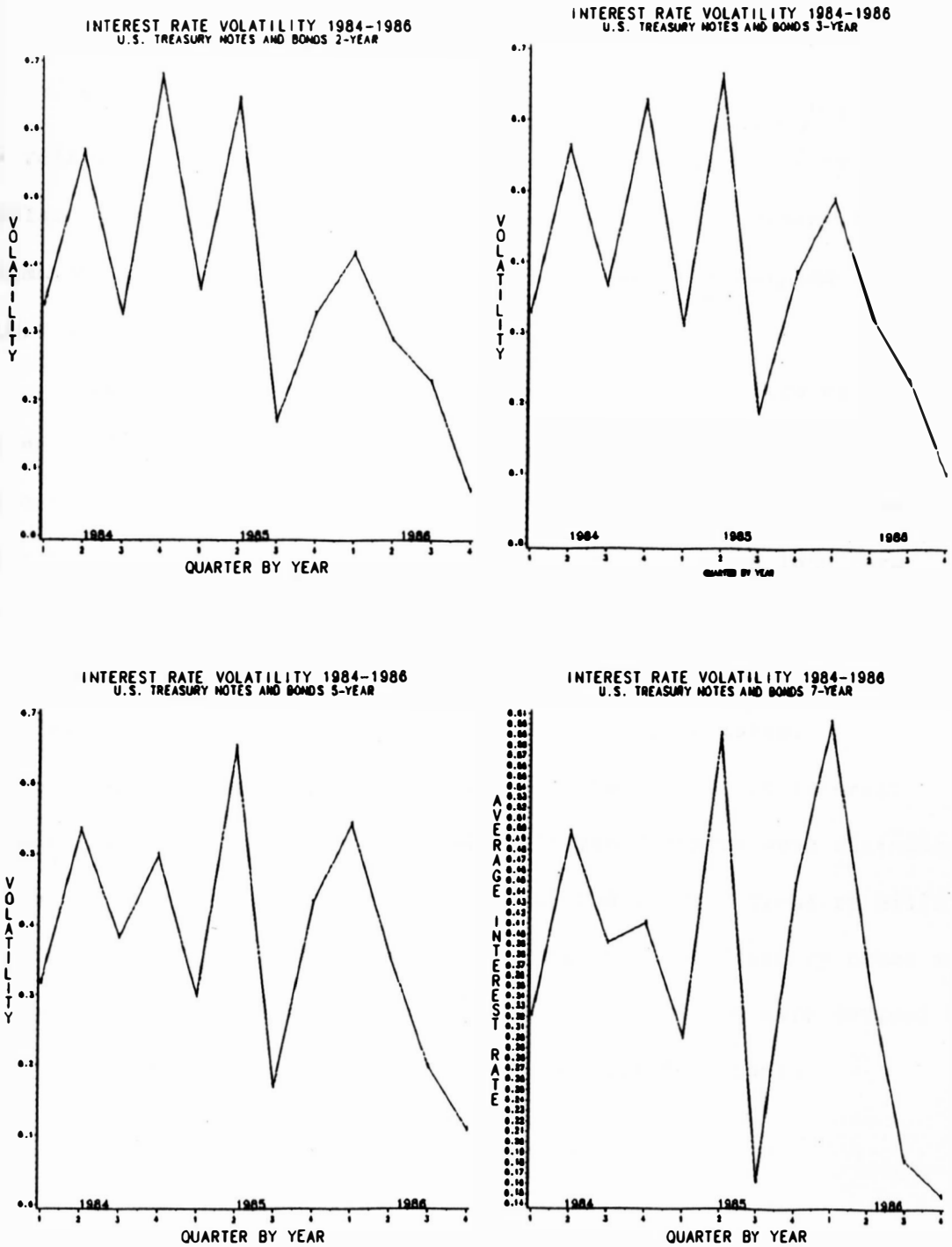

INTEREST RATE VOLATILITY 1984-1986
FEDERAL FUNDS RATE
VOLATILITY
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY BILLS 3-MONTH
VOLATILITY
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY BILLS 6-MONTH
VOLATILITY
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY BILLS 1-YEAR
VOLATILITY
1984
1985
1986
QUARTER BY YEAR

FIGURE 4.4


INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY NOTES AND BONDS 2-YEAR
VOLATILITY
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY NOTES AND BONDS 3-YEAR
VOLATILITY
1984
1985
1986
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY NOTES AND BONDS 5-YEAR
VOLATILITY
1984
1985
1986
QUARTER BY YEAR
INTEREST RATE VOLATILITY 1984-1986
U.S. TREASURY NOTES AND BONDS 7-YEAR
AVERAGE INTEREST RATE
1984
1985
1986
QUARTER BY YEAR

The Term Structure of Interest Rates: 1984-86

The term structure of rates describes the relationship between the relative yields on financial claims with differing maturities and similar risks. The market rates used in this study represent the claims on financial instruments of different maturity periods (months) with similar risks.

There are three frequent patterns of term structure or yield curves: flat, descending, and ascending curves. The flat curve indicates that short term and long term rates are approximately equal. Short term rates are rates on short-term instruments and long term rates are rates on long-term instruments. A descending curve implies short term rates are significantly above long term rates. An ascending curve signifies short-term rates are below long-term rates.

Figure 4.5 illustrates the yield curves of market interest rates during the 1984 to 1986 period. All yield curves were ascending curves, implying short term rates (represented by U.S. Treasury bills) were lower than long term rates (represented by U.S. Treasury notes and bonds). The yield curves for each quarter from 1984-86 were derived by plotting the regression estimates of the semilog function:

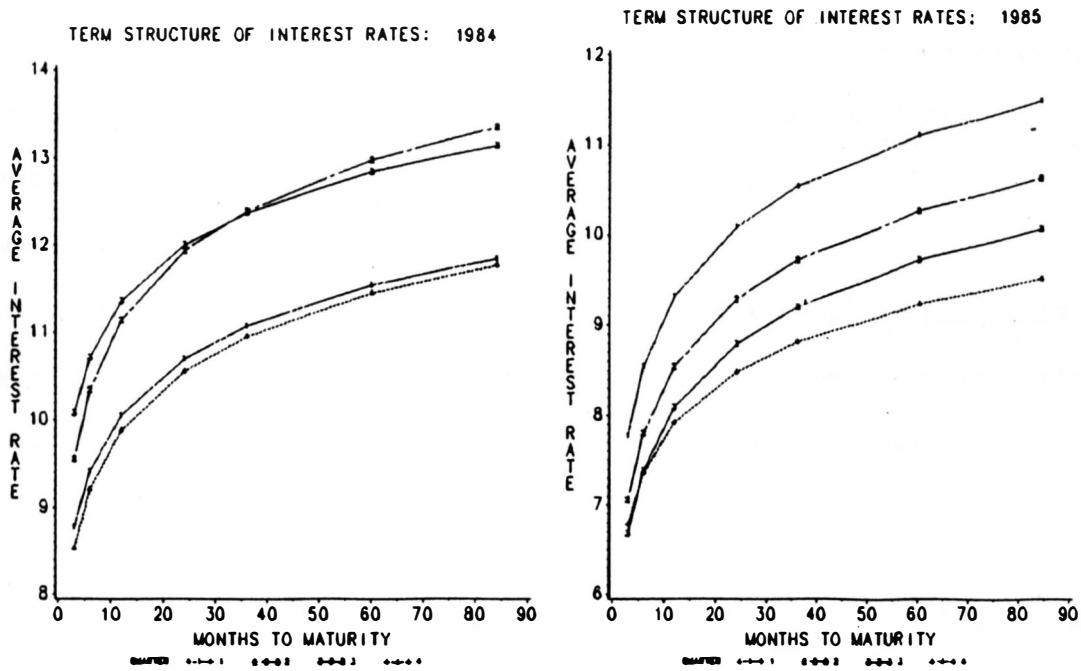
$$r = \alpha + \beta \ln m$$

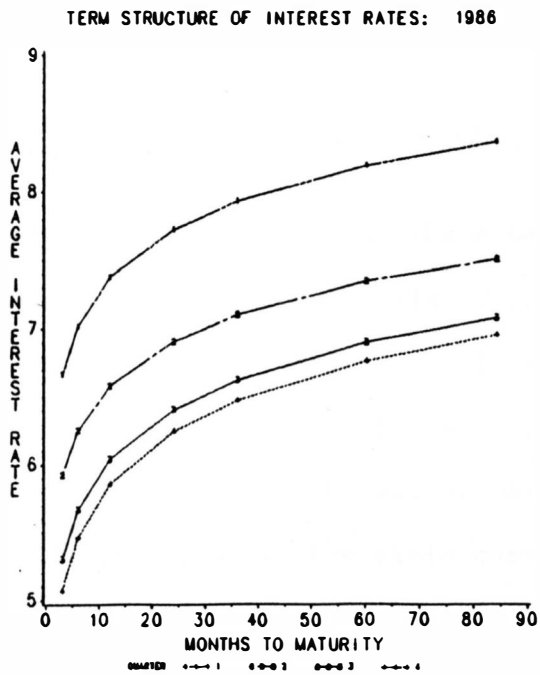
where

r = interest rates
$\ln m$ = natural logarithm of maturity
α, β = intercept and slope, respectively.

Regression estimates of the function are reported in Table 4.3.

FIGURE 4.5


TERM STRUCTURE OF INTEREST RATES: 1984
AVERAGE INTEREST RATE
MONTHS TO MATURITY
TERM STRUCTURE OF INTEREST RATES: 1985
AVERAGE INTEREST RATE
MONTHS TO MATURITY


TERM STRUCTURE OF INTEREST RATES: 1986
AVERAGE INTEREST RATE
MONTHS TO MATURITY

The function produced estimates that fit the data well, exhibiting high adjusted R^2's. The parameter estimates are all highly significant and have the expected magnitudes and signs. α and β represent the estimated risk free rate and slope of the semilog function respectively.

The expectations hypothesis can be used to explain the shift and slope of the yield curves. The slope of the yield curve is derived by differentiating the semilog function with respect to maturity:

$$r = \alpha + \beta \ln m$$

$$\frac{dr}{dm} = \frac{\beta}{m}$$

The slope of the yield curve, β/m, gives the shape of the yield curve. At shorter maturities, the yield curve will be steeper and as maturity increases, the yield curve will be less steep.

The Expectations Hypothesis

This hypothesis states that the shape of the yield curve depends on the expectations of future levels of interest rates by market participants. The shape of the yield curve is a function of its slope; therefore expectations and the slope of the yield curve are related. The slope of the yield curve reflects market participants' expectations of future rates. If the slope of the yield curve is steeper compared to the slope of the curve in the preceeding period, then rates were expected to rise, and vice-versa. If there was no change in slope, then rates were not expected to change.

Using the above criteria, and examining the yield curves in Figure 4.5 with the given β in Table 4.3, expectations in relation to changes in the slope of the curves can be determined. If asset-liability managers expect rates to increase, ceteris paribus, more funds will be invested in short-term assets to maximize returns; if rates are expected to fall, more funds will be invested in long-term assets in order to also maximize returns. On the liability side, if rates are expected to increase, more long-term liabilities should be held to minimize cost; and if rates are expected to fall, more short-term liabilities should be held likewise to minimize cost. Forecasting is primarily done in order to reduce the risks of adverse changes in returns during any period due to changes in interest rates.

What was the asset-liability management strategy and the composition of assets and liabilities of banks in South Dakota from 1984-86? Do changes in management strategy based on short-term and long-term asset-liability composition reflect expectations of future interest rates?

The data available on banks are the repriceable assets and liabilities, and income statement for the second quarter of each year from 1984 to 1986. Rates increased in 1984 (until the third quarter), and declined in the remaining periods. Did banks forecast such rate changes and were their portfolios adjusted accordingly?

Table 4.3 Regression Results

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
		1984		
α	7.756[a]	8.298[a]	9.060[a]	7.460[a]
	(57.420)	(50.445)	(65.875)	(35.892)
β	0.925[a]	1.143[a]	0.924[a]	0.974[a]
	(21.652)	(21.971)	(21.244)	(14.813)
$\bar{R}^2$	.838	.842	.833	.708
Mean of the dep. var.	10.487	11.673	11.788	10.336
		1985		
α	6.550[a]	5.884[a]	5.565[a]	5.894[a]
	(49.162)	(30.832)	(54.348)	(48.602)
β	1.111[a]	1.069[a]	1.013[a]	0.813[a]
	(26.370)	(17.707)	(31.291)	(21.204)
$\bar{R}^2$	.885	.776	.915	.832
Mean of the dep. var.	9.832	9.040	8.558	8.296
		1986		
α	6.110[a]	5.403[a]	4.714[a]	4.451[a]
	(45.572)	(57.911)	(55.794)	(68.470)
β	0.508[a]	0.474[a]	0.534[a]	0.565[a]
	(11.993)	(16.070)	(19.976)	(27.478)
$\bar{R}^2$	.613	.740	.815	.893
Mean of the dep. var.	7.610	6.800	6.290	6.120

Note: t-ratios in parenthesis
a= significant at 1% level (two-tail test)

Asset-Liability Management Strategy: 1984-86

The specific portfolio of assets to be examined are debt securities because they reflect asset management strategy. The portfolio of liabilities to be examined are other time deposits and nondeposit interest bearing liabilities combined. These assets and liabilities are divided into short-term and long-term components according to maturity. The short-term component are those maturing within one year; and the long-term components are those with maturity greater than one year. (See appendix for classification).

These components of assets and liabilities are reported in Table 4.4 by bank size for the second quarter of each year from 1984 to 1986. Examining the pattern of short-term and long-term debt securities might give an indication of asset management strategy. Whether this reflects expectations is not known. An observation is that each year, banks of all sizes consistently held a larger share of earning assets in long-term debt securities.

Banks with less than $10 million in assets increased short-term debts from 1984 to 1986; their long-term debts declined in 1984-85, and increased in 1985-86. Banks with assets between $10 and $25 million reduced short-term debts in 1984-85, and increased it by a small margin in 1985-86. Their long-term debts declined in 1984-85, and was increased in 1985-86. Banks with assets between $25 and $50 million reduced their short-term debts from 1984 to 1986. Their long-term debts was also reduced in 1984-86, and was increased in 1985-86. Banks

Table 4.4

Debt Securities (as a Percentage of Earning Assets) by Bank Size, for the Second Quarter of each Year, 1984-1986

	Bank Size							
Year	A<$10million		$10<A>$25million		$25<A>$50million		A>$50million	
	ST	LT	ST	LT	ST	LT	ST	LT
1984	14.11	20.85	14.79	27.48	11.97	27.23	12.40	25.57
1985	14.69	18.61	13.21	26.99	10.56	23.26	13.80	24.33
1986	15.93	24.16	13.43	27.25	9.16	26.23	12.72	31.86
Other Time and Nondeposit Interest-Bearing Liabilities (as a Percentage of Earning Assets)								
1984	88.75	13.51	66.03	8.84	71.98	11.75	61.88	12.93
1985	65.43	18.33	64.84	10.42	65.01	15.31	67.29	14.11
1986	75.28	14.12	68.11	11.78	68.10	13.55	75.96	13.78

Note : ST = Short-term
LT = Long-term

with assets greater than $50 million increased their short-term debts in 1984-85, and reduced it in 1985-86. Their long-term debts was reduced in 1984-85, and increased in 1985-86. The pattern of composition from 1984 to 1986 indicates that banks of different asset size had different asset management strategies.

The pattern of composition of liabilities also differed by bank size, except for banks with less than $10 million in assets and those with assets between $25 and $50 million. An observation is that banks of all sizes during this period held a larger share of earning assets in short-term liabilities.

Banks with assets less than $10 million reduced short-term liabilities in 1984-85, and increased it in 1985-86. Their long-term liabilities increased in 1984-85, and declined in 1985-86. This was also the pattern of the composition of liabilities for banks with assets between $25 and $50 million. Banks with assets between $10 and $25 million reduced short-term liabilities in 1984-85, and increased it in 1985-86. Their long-term liabilities increased in the entire period of 1984 to 1986. Banks with assets greater than $50 million increased short-term liabilities from 1984 to 1986. Their long-term liabilities increased in 1984-85, and was reduced in 1985-86.

Results from Table 4.4 shows that the asset-liability management strategy of banks by size were different during 1984 to 1986 by focusing on the pattern of the composition of the short-term and long-term assets and liabilities.

Asset-Liability Composition: 1984-86

Because asset-liability management strategies differ, the composition of assets and liabilities by maturity category may also be different by bank size. This can be tested using the Duncan multiple range test. The test compares averages and reports whether or not they are significantly different.

Results of this test using a 10% level of significance are presented in Tables 4.5, and 4.6. The average of each size group by maturity category in each year are compared and tested for significant differences in the following way: the largest minus the smallest, the largest minus the second smallest, up to the largest minus the second largest; then the second largest minus the smallest, the second largest minus the second smallest, and so on, finishing with the second smallest minus the smallest. (Duncan, 1955) For example, the order of testing if the average loans and lease financing receivables maturing in 1-day in 1984 for each size group are significantly different is: 13.33-8.39, 13.33-8.54, 13.33-10.43, 10.43-8.39, 10.43-8.54, and finally 8.54-8.39.

Before comparing each average and testing for significant differences, the shortest significant range of each average is first computed. These are obtained by multiplying the significant studentized range of each average by its standard error.

Two averages are significantly different if the difference between the two exceeds the corresponding shortest significant range.

Table 4.5 Average Composition of Repriceable Assets (as a Percentage of Earning Assets) by Bank Size and Maturity Categories for the Second Quarter of each Year, 1984-86

Maturity Category	A<$10million			$10<A>$25million			$25<A>50million			A>$50million		
	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
All Loans and Lease Financing Receivables												
1day	13.33	19.15	7.05	10.43	11.69	11.39	8.54	7.95	11.71	8.39	10.36	9.10
3m	19.08	15.43	16.34	12.96	13.18	11.49	21.48	20.91	13.11	11.63	11.06	14.76
<3m	14.50	12.50	10.49	14.98	12.72	11.13	12.09	12.45	9.00	9.09	8.44	9.28
6-12m	2.30	2.18	2.37	6.97	4.98	6.06*	3.74	3.68	3.70	6.00	5.86	5.20
1-5yr	4.61	4.16	4.42	6.30	6.43	6.14	5.61	6.59	6.20	11.31	11.47*	10.41*
>5yr	0.86	0.58	3.18	3.43	2.77	4.10	5.87*	6.06*	8.05	11.54**	9.07**	4.93
Total	54.70	54.03	43.87	55.08	51.68	50.34	57.35	57.66	51.81	57.99	56.27	53.70
Debt Securities												
1day	0.00	0.00	0.56	0.19	0.07	0.00	0.14	0.00	0.21	0.00	1.34*	1.93
<3m	6.27*	5.11	6.24*	3.09	3.46	2.53	2.11	4.01	1.74	3.60	3.73	3.07
3-6m	4.03	3.09	2.27	3.93	4.01	5.31*	2.96	2.59	1.97	3.61	3.51	2.43
6-12m	3.80	6.47	6.85	8.11	5.67	5.58	6.74	3.95	5.23	5.19	5.20	5.28
1-5yr	20.34	17.90	23.09	21.74	20.85	19.88	21.38	17.88	21.21	19.14	20.85	21.19
>5yr	0.51*	0.70	1.07	5.74	6.13	7.36*	5.85	5.38	5.02	6.42	6.13	10.67**
Total	34.97	33.33	40.09	42.40	40.21	40.68	39.20	33.83	35.40	37.97	38.14	44.59
Other Interest-Bearing Assets												
1day	11.18*	8.51*	11.18*	2.54	4.50	6.67**	2.66	4.34	4.12	1.58	2.93	2.56
<3m	0.00	0.00	0.35	0.61	0.55	0.38	0.41	1.72	0.80	0.21	0.10	0.44
3-6m	0.00	0.55	0.27	0.09	0.27	0.22	0.23	0.27	0.33	0.72*	0.40	0.24
6-12m	0.00	0.00	0.00	0.23	0.28	0.79	0.06	0.54	0.42	0.01	0.32	0.34
1-5yr	0.00	0.00	0.34	0.25	0.78	0.26	0.56	0.38	1.58	0.87*	0.72	0.63
>5yr	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.08	0.00	0.02*	0.02
Total	11.18*	9.06	12.15*	3.74	6.40	8.34	3.99	7.28	7.36	3.41	4.52	4.25

Note : **The average of each size group were compared by year using the Duncan multiple range test, at 10% level of significance.**

An average with an asterisk indicates that it is significantly different from other averages in that maturity category across bank groups for that year.

Averages of the same maturity category and year with an equal number of asterisks or no asterisks implies those averages are not significantly different.

Table 4.6 Average Composition of Repriceable Liabilities (as a Percentage of Earning Assets) by Bank Size and Maturity Category for the Second Quarter of each Year, 1984-86

	Bank Size											
	A<$10million			$10<A>$25million			$25<A>$50million			A>$50millon		
Maturity category	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
Time Certificate of Deposits												
1day	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.06	0.66	0.09	0.00	0.00
<3m	0.90	1.58	1.68	3.89*	4.49	3.91	2.90	2.71	3.03	3.54	4.19	3.32
3-6m	2.07	2.07	1.57	3.92	3.15	3.21*	1.70	1.97	1.63	1.55	1.46	1.56
6-12m	0.00	0.75	0.27	0.09	0.80	1.17*	0.51	0.90	0.93	1.01*	0.88	0.94
1-5yr	0.42	0.00	0.00	0.28	0.59	0.60	0.16	0.32	0.27	0.33	0.66	0.33
>5yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02*	0.02*
Total	3.40	4.42	3.53	9.00*	9.05*	8.90	5.47	5.98	6.53	6.53	7.24	6.19
All Other Time Deposits												
1day	41.94*	25.28	35.29	25.72	28.07	34.45	28.93	26.37	30.33	21.84	31.55	39.18
<3m	18.50	20.14*	17.24	15.75	16.99	14.11	17.32	17.00	13.62	15.50	15.87	15.45
3-6m	18.27*	15.56*	15.21	15.14	13.39	12.48	14.71	13.90	14.97	14.48	12.04	12.95
6-12m	10.02	4.44	7.52	8.76	5.63	6.51	9.59	5.90	8.03	7.94	6.20	7.07
1-5yr	13.51*	18.33*	14.12	8.76	10.40	11.67	11.62	15.21**	13.45	12.23	13.74	13.31
>5yr	0.00	0.00	0.00	0.08	0.01	0.11	0.04	0.02	0.02	0.04	0.32*	0.01
Total	102.25*	83.76	89.40	74.23	74.52	79.23	82.25	78.12	80.47	72.05	79.46	87.94
Nondeposit Interest-Bearing Liabilities												
1day	0.00	0.00	0.00	0.13	0.31	0.05	0.87	0.01	0.56	0.67	0.71	0.48
<3m	0.00	0.00	0.00	0.51	0.44	0.49	0.34	1.79	0.52	1.23	0.60	0.80
3-6m	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.02	0.04	0.18	0.28*	0.00
6-12m	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.03*	0.00
1-5yr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56*	0.00	0.22
>5yr	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.07	0.07	0.09	0.32*	0.23*
Total	0.00	0.00	0.00	0.64	0.75	0.54	1.48	1.89	1.19	2.73	1.94	1.73

Note : The average of each size group were compared by year using the Duncan multiple range test, at 10% level of significance.

An average with an asterisk indicates that it is significantly different from other averages in that maturity category across bank groups for that year.

Averages of the same maturity category and year with an equal number of asterisks or no asterisks implies those averages are note significantly different.

The only exception is that no difference between two averages can be declared significant if the two averages are found in a region of an average which has a non-significant range. For example, if the average of banks with asset size less than $10 million is compared to that of banks with asset size between $10 and $25 million, depending on which has the largest average, if the difference between the two averages exceeds the shortest significant range of the largest, then the two averages are significantly different; but if the difference between the two averages does not exceed the shortest significant range of the largest average, then the two averages are not significantly different. If the average of another size group falls within the two averages just compared and they are not significantly different, then this average cannot be significantly different from the largest average. A significant result implies that bank size is a factor in explaining differences in asset liability composition.

The results of a Duncan multiple range test on portfolio composition of assets and liabilities by maturity category and bank size are reported in Tables 4.5 and 4.6. The test are reported using a 10% level of significance. An average with an asterisk indicates that it is significantly different from other averages in that maturity category across bank size groups for that year. Two averages or more in the same maturity category and year with an equal number of asterisks or no asterisks implies those averages are not significantly different.

Examining Table 4.5, there are some significant differences in

the composition of repriceable assets by maturity category for each size group during the 1984-86 period. This result suggests that banks of different sizes have different asset management strategies. Do these results indicate that asset size is a major factor in bank management decisions on asset composition? Because only a few significant differences are observed, it would appear that asset size is a factor in asset composition decisions, but not a major factor; this indicates differences in asset-liability composition can not be explained solely by differences in size.

Table 4.6, which reports the average composition of repriceable liabilities by maturity category and size group, shows similar results as asset composition. There are some significant differences in the composition of repriceable liabilities by maturity category. This supports the hypothesis that liability management strategy for each size group differs. Because only few significant differences are observed between each size group during this period, however, it is likely that asset size is not a major factor in liability composition decisions.

The preceding analysis found that asset-liability management strategy and bank asset and liability composition were different during the period 1984 to 1986, but that the differences were not mainly due to differences in bank size.

Table 4.7 presents the average second quarter interest income and expense by bank size from 1984 to 1986. Total interest income and expense for all the bank size groups declined during this period. This

Table 4.7 Average Interest Income and Interest Expense (as a Percentage of Earning Assets) by Bank Size for the Second Quarter of each Year, 1984-86

Bank Size												
A<$10million			$10<A>$25million			$25<A>$50million			A>$50million			
1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986	
Total Interest Income												
6.06	6.00	5.48	6.48	6.22	5.44	6.05	5.97	5.00	5.93	5.77	5.52	
%Δ	-0.99	-8.66		-4.01	-12.54		-1.32	-16.25		-2.70	-4.33	
Total Interest Expense												
3.67	3.57	3.04	3.86	3.56	3.04	3.81	3.61	3.19	3.96	3.63	3.20	
%Δ	-2.72	-14.85		-7.77	-14.61		-5.25	-11.63		-8.33	-11.85	
Net Interest Margin												
2.39*	2.43	2.44	2.62	2.66*	2.40	2.23	2.36	1.81*	1.97	2.14	2.32	
%Δ	+1.26	+0.41		+1.53	-10.15		+5.38	-23.40		+8.12	+8.45	
Total Noninterest Income												
0.34	0.34	0.34	0.29	0.31	0.32	0.46	0.28	0.28	0.30	0.38	0.29	
%Δ	0.00	0.00		+6.90	+3.23		-39.13	0.00		+21.05	-23.68	
Total Noninterest Expense												
1.54	1.68	1.83	1.54	1.64	1.65	1.29	1.27	1.36	1.29	1.38	1.40	
%Δ	+9.09	+8.93		+6.49	+0.61		-1.55	+7.09		+6.98	+1.45	
Net Income (Loss)												
0.88	0.38	0.06	0.85	0.84*	0.48	0.79	0.72	-0.11	0.41	0.57	0.48	
%Δ	-56.82	-84.21		-1.18	-42.86		-8.86	-115.28		+39.02	-15.79	

is a result of increased competition due to deregulation, the decline in interest rates, and the farm crisis.

Results indicate very few significant differences in interest income and expense by size. Though there are differences in income and expense, size is not a major factor in explaining these differences. Based on the trend in interest income, and net income, evidence suggests that banks in South Dakota did not perform well during this period. Average total interest income for all size groups declined from 1984 to 1986; so did average net income, except for banks with assets greater than $50 million in 1984-1985. From the net interest margin data, it can be implied that banks of different sizes performed differently based on the growth (decline) of this component.

The net interest margin of banks with less than $10 million in assets increased by 1.26% in 1984-85, and 0.41% in 1985-86. For banks with assets between $10 and $25 million this component increased by 1.53% in 1984-85, and fell by 10.15% in 1985-86. Those with assets between $25 and $50 million had an increase of 5.38% in 1984-85, and in 1985-86, a 23.40% decline. For banks with assets greater than $50 million net interest margin grew 8.12% in 1984-85, and 8.45% in 1985-86.

Based on these observations, net interest margin was more stable at banks with greater than $50 million in assets. This group was followed by those with assets less than $10 million, bank groups with assets with assets between $10 and $25 million, and $25 and $50 million respectively. Judging from these results, banks with assets

greater $50 million performed better than others.

Conclusion

This chapter analyzed the trend in market interest rates, compared asset-liability management strategy, asset-liability composition, and income statement results of banks in South Dakota by size from 1984-86.

Results indicate that rates declined during this period, and that the volatility of rates after the fourth quarter of 1984 was relatively low. The data on interest income, interest expense, net interest margin and net income indicate that generally, banks in South Dakota did not perform well during this period, though some banks did better than others. Banks with assets greater than $50 million performed better than the other groups of banks.

An analysis of asset-liability management strategy indicates that banks of different size differed in their asset-liability management strategy. An observation is that banks of all sizes consistently held a larger share of earning assets in long-term debt securities, and a larger share in short-term liabilities. The Duncan multiple range test was performed to determine if size is a significant decision criteria in the composition of assets and liabilities. While there were some significant differences in the composition of some categories of assets and liabilities, it was concluded that these were too few to determine that size is a major factor in the composition of assets and liabilities.

The next chapter will determine if geographical market (location) plays a major role in asset-liability management strategy, and the composition of assets and liabilities of banks in South Dakota.

CHAPTER V

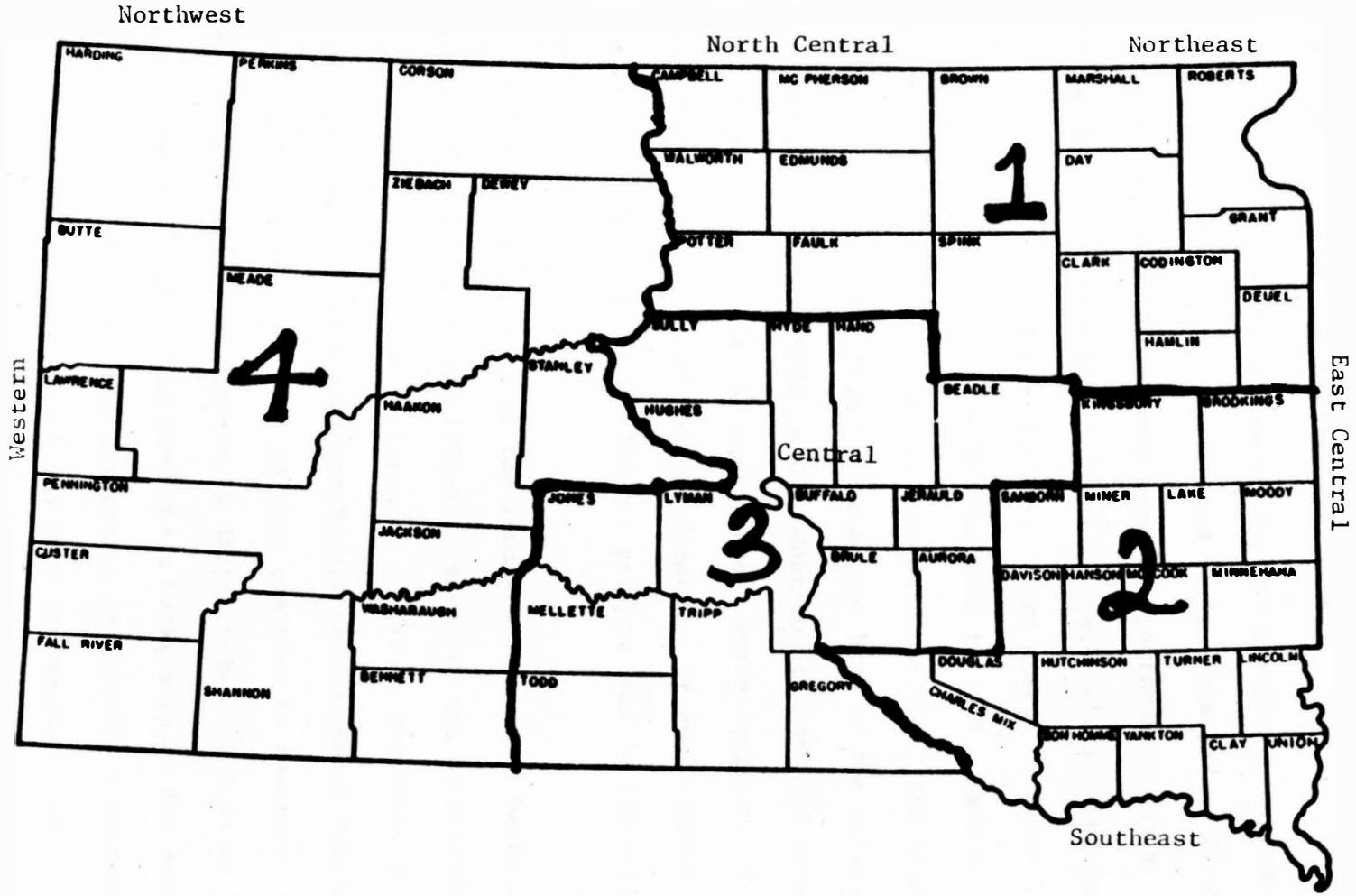
Analysis of Asset-Liability Management Strategy / Composition of Banks by Crop Reporting District

In the previous chapter, results from the analysis of short-term and long-term assets and liabilities of banks by size indicate that there were differences in asset-liability management strategy. Statistical test results indicate bank size is a factor, but not a major factor in the composition of assets and liabilities. This chapter will examine the asset-liability management strategy, asset-liability composition, and the performance of banks by crop reporting district.

In order to accomplish this analysis, agricultural areas in South Dakota were grouped into four districts based on types of crop and livestock production, soil fertility, and average farm size. The Crop Reporting Districts are: (1) Northeast and North Central; (2) East Central and Southeast; (3) Central and South Central; and (4) Northwest and Western (see Figure 5.1).

Due to differences in crop and livestock production by region, it is possible that financial institutions that support these regions differ in performance. The farming industry has encountered financial problems in recent years. As a result many farms failed, especially family farms. Belongia and Carrero (1985) observed the sharp decline

Figure 5.1
Crop Reporting Districts



nationwide in real farm income and asset value, greater increases in farm loan defaults, and bank failures since 1982.

Because South Dakota's economy depends heavily on agricultural production and agriculturally related industries, the recent farm crisis is a detriment to the general economic performance of the state. The balance sheet statement of all farms in South Dakota is presented in Table 5.1 for the period 1983 to 1985. Farm assets declined by 17.9% from 1983 to 1984 and by 10.9% from 1984 to 1985. Farm debt declined by 1.14% and 6.11% for the same periods. Thus, the value of farm assets declined faster than farm debt for both of the periods.

During the 1983 to 1985 period, debt-equity and debt-asset ratios both increased, while the equity-asset ratio declined. Using these results as indicators of farm performance, it would appear the farming industry in South Dakota did not perform well in the period 1983-1985.

Similarly, an analysis of the income statement of banks by size indicates poor performance from 1984-86. Based on the differences in crop and livestock production of farms by district, are banks in each of these districts different in asset-liability management strategy and asset-liability composition? Before this question is addressed an analysis of agricultural production by district for the 1984 to 1986 period will be presented. This provides a background on the economic viability of each district. The assumption is that the economic performance of farms in a district may have an impact on the performance of banks in that district.

Table 5.1

FARM BALANCE SHEET,

SOUTH DAKOTA, DECEMBER 31, 1983-1985

ITEM	1983	1984	1985
		Million Dollars	
Total Farm Assets	21,761.5	17,861.5	15,916.1
Total Farm Debt	5,408.6	5,346.7	5.020.2
Real Estate Debt	2,126.4	2,089.6	1,944.2
Nonreal Estate Debt	2,808.2	2,810.1	2,486.9
CCC Loans	474.0	447.0	589.0
Equity	16,353.0	12,514.8	10,895.9
		Ratio	
Equity/Assets	75.1	70.1	68.5
Debt/Equity	33.1	42.7	46.1
Debt/Assets	24.9	29.9	31.5

Note : Excluding operator household.
Source : South Dakota agricultural statistics, published May 1987.

Comparison of Agricultural Production by Districts: 1984-86

Table 5.2 presents data on the amount of some selected crops generally produced in all the districts. Also presented in this table is the average annual price received for each crop from 1984 to 1986. Data on the number of livestock produced by district is not available. The average annual price received for livestock is available, and this would serve as a proxy for comparison to evaluate regional performance.

From Table 5.2, it shows that some districts are more productive than others because of differences in the amounts of crops produced. Each district can be ranked accordingly, based on their production capacity from 1984 to 1986. Table 5.3 reports the rank of each district on the basis of the amount produced of the selected crops in the 1984 to 1986. The northwest and western district rank lowest in all crops produced except for wheat. This is because livestock is the major agricultural output in these districts and they rank highest in livestock production in the state. Though the amount of crops produced in each district fluctuated from 1984 to 1986, the average annual price received for each crop declined.

The information published by the South Dakota Crop and Livestock Reporting Service in May of 1986 and 1987 concurrently, indicated that total farm receipts for South Dakota in 1984, including government payments, was $3,120 million. Livestock accounted for 58%, crops 35%, and government payments 7%, of the total. In 1985, total farm receipts for South Dakota including government payments was $3,211

Table 5.2 Selected Crops Produced (in millions) by Districts and Average Annual Prices Received, 1984-1986

	Crop Reporting District											
	NE & NC			EC & SE			C & EC			NW & W		
Crops	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
Corn (bu)	44273	51107	53825	111733	170041	148195	26867	28520	28455	3387	2332	3225
Wheat (Ib)	55340	53268	44868	5708	9915	7386	33830	28555	29089	31159	19477	27313
Oats (bu)	35373	22180	15268	23712	42781	16201	19562	12397	9801	8153	2162	4930
Soybeans (bu)	5641	5804	7245	24936	34260	33165	648	556	805	54	20	15
Barley (bu)	20103	20452	22134	2369	4860	5230	3940	4216	5208	3933	2872	3338
Sunflower(cwt)	332287	289970	254140	69441	75560	50310	187872	210500	180420	43880	33910	24590

Average Prices Received

	1984	1985	1986
Corn	2.67	2.36	1.84
Wheat	3.49	3.25	2.29
Oats	1.53	1.07	1.10
Soybeans	5.53	4.80	4.55
Barley	1.98	1.75	1.15
Sunflower	10.00	7.88	6.25

Data Source: South Dakota Agricultural Statistics publication of May 1986 and 1987.

Table 5.3 Crop Production by District and Rank, 1984-86

	Corn	Wheat	Oats	Soybeans	Barley	Sunflower
NE & NC	2	1	2	2	1	1
EC & SE	1	4	1	1	3	3
C & SC	3	2	3	3	2	2
NW & W	4	3	4	4	4	4

Ranking: 1 = highest, 4 = lowest

Data Source: South Dakota Agricultural Statistics Publication of May 1986 and 1987

million. This was a 2.9% increase over 1984. Livestock accounted for 59%, crops 34%, and government payments 7%. It is worth emphasizing that government payments accounted for a small portion of income to farmers. The data for 1986 were not yet available but the percentage shares of income to farmers from livestock production, crop production, and government payments are not expected to be significantly different from those for 1984 and 1985. Among livestock and crops produced, cattle and calves were the largest source of income to farmers in 1984 and 1985, followed by wheat and hogs.

The average annual price received on some livestock produced by farmers from 1984 to 1986 is reported in Table 5.4. The 1985 average prices were both up and down from 1984. The average price for beef cattle, steers and heifers, and cows declined while the average price for calves, sheep, and lambs increased. The same trend can be observed from 1985 to 1986.

The general decline in the price farmers received for agricultural products coupled with the value of farm assets declining faster than farm debts contributed to the recent farm crisis. Given this scenario, how well did banks located in each district perform from 1984-86?

Asset-liability Management Strategy: 1984-86

The asset-liability management strategy of banks by crop reporting district can best be observed by analyzing the loan and deposit portfolios of banks in each district.

Table 5.4 Average Annual Price Received for Livestock (Dollars per Hundredweight), 1984-86

	1984	1985	1986
Beef Cattle	57.80	54.90	52.60
Steers & Heifers	61.60	59.10	57.20
Cows	39.40	37.10	36.80
Calves	66.20	66.30	66.90
Sheep	16.00	23.60	27.60
Lambs	60.50	68.50	70.40
Hogs	46.70	43.40	48.80

Data Source: South Dakota Agricultural Statistics Publication of May 1986 and 1987

The average short-term and long-term loans of banks by district from 1984-86 is presented in Table 5.5. As might be expected, short-term loans are greater than long-term loans risk aversion likely causes banks to match their short term liabilities with their short term assets.

The short-term and long-term loans of banks in the northeast and north central districts declined from 1984 to 1986. Banks in the east central and southeast districts also reduced the amount of short-term loans, but increased long-term loans over the same period. The short-term loans of banks in the central and south central districts declined from 1984 to 1986, while long-term loans were reduced in 1984-85, and increased in 1985-86. Banks in the northwest and western district increased short-term loans in 1984-85, and in 1985-86 reduced the amount held while long-term loans were reduced in 1984-85, and increased in 1985-86.

Banks in the northeast and north central, the east central and southeast, and the central and south central districts show similar trends in the management of short-term loans during the 1984 to 1986 period, except for banks in the northwest and western district. Banks in the central and south central, and the northwest and western districts had similar trends in the long-term loans over the same period. Banks in the northeast and north central, and east central and south east districts had different trends.

Banks in the northeast and north central, the central and south central, and the northwest and western districts reduced short-term

Table 5.5

Average Repriceable Short-term and Long-term Loans
(as a Percentage of Earning Assets) by Crop Reporting District,
for the Second Quarter of each Year, 1984-1986

	NE & NC		EC & SE		C & SC		NW & W	
	ST	LT	ST	LT	ST	LT	ST	LT
1984	47.52	10.53	42.40	11.56	46.46	11.78	42.87	11.89
1985	46.24	9.97	38.42	14.01	44.71	10.61	44.15	10.78
1986	41.38	9.06	33.23	14.62	38.31	11.58	41.52	12.46

Average Repriceable Short-term and Long-term Deposits
(as a Percentage of Earning Assets) by Crop Reporting District,
for the Second Quarter of each Year, 1984-86

1984	67.25	12.71	67.65	10.83	71.20	10.57	68.75	8.34
1985	58.81	16.87	68.49	13.61	60.90	13.56	67.68	9.68
1986	60.23	16.68	75.03	12.93	72.05	12.53	71.33	9.34

Note : Short-term and long-term loans are all loan and lease financing receivables.

Short-term and long-term deposits are other time deposit and all open-account time deposit combined.

Table 5.6 Average Composition of Repriceable Assets (as a Percentage of Earning Assets) Crop Reporting District and Maturity Category for the Second Quarter of each Year, 1984-86

Maturity Category	NE & NC 1984	NE & NC 1985	NE & NC 1986	EC & SE 1984	EC & SE 1985	EC & SE 1986	C & SC 1984	C & SC 1985	C & SC 1986	NW & W 1984	NW & W 1985	NW & W 1986
All Loans and Lease Financing Receivables												
1day	13.21	17.65*	14.79*	7.09	6.21	7.75	4.33	1.13	1.84	14.93	18.88*	16.98*
<3m	14.43	13.00	11.89	19.90	17.34	11.61	20.21	23.11*	20.39*	10.57	10.19	9.80
3-6m	11.84	10.84	10.08	12.08	11.37	9.89	16.92	15.45	11.13	12.72	10.80	9.32
6-12m	8.02	4.74	4.60	3.31	3.48	3.96	4.99	5.01	4.94	5.17	4.26	5.41
1-5yr	6.32	5.44	5.94	6.43	7.64	7.29	6.67	7.28	6.60	6.53	7.26	6.91
>5yr	4.21	4.52	3.12	5.13	6.37	7.32	5.10	3.33	4.97	5.36	3.51	5.54
Total	58.03	56.22	50.42	53.94	52.41	47.82	58.22	55.31	49.87	55.28	54.90	53.96
Debt Securities												
1day	0.09	0.00	0.13	0.00	0.78*	1.28	0.14	0.00	0.36	0.32	0.00	0.09
<3m	3.07	2.27	4.10*	2.30	5.90*	2.93	3.22	4.26	1.63	3.91	2.90	2.84
3-6m	2.82	1.98	2.09	2.86	3.46	3.98*	3.47	2.94	1.63	4.21	4.99*	5.63**
6-12m	6.33	4.04	5.23	7.45	5.29	5.50	4.83	4.68	5.03	8.83	6.41	6.57
1-5yr	20.81	20.37	19.23	22.32	19.04	24.94	20.09	17.31	21.20	21.41	19.70	18.08
>5yr	4.41	4.90	5.03	6.57	5.21	6.37	4.82	5.34	9.53	5.49	5.59	5.01
Total	37.53	33.53	35.81	41.50	39.68	45.00	36.57	34.53	39.38	44.17	39.59	38.22
Other Interest-Bearing Assets												
1day	3.74	5.02	6.43	2.95	4.42	5.40	4.59	6.75*	6.35	1.89	2.76	5.04
<3m	0.88	0.51	0.35	0.22	0.06	0.58	0.15	2.21	0.82	0.49	0.73	0.31
3-6m	0.22	0.74*	0.59*	0.00	0.14	0.20	0.52*	0.13	0.24	0.11	0.26	0.03
6-12m	0.42*	0.71	0.64	0.00	0.23	0.11	0.00	0.15	0.49	0.09	0.28	0.76
1-5yr	0.69	0.51	1.15	0.39	0.33	0.21	0.09	0.06	1.19	0.41	1.27	0.45
>5yr	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00
Total	6.00	7.50	9.17	3.56	5.18	6.50	5.35	9.30	9.20	2.99	5.30	6.59

Note : The average of each district were compared by year using the Duncan multiple range test, at 10% level of significance.

An average with an asterisk indicates that it is significantly different from other averages in that maturity category across districts for that year.

Averages of the same maturity category and year with an equal number of asterisks or no asterisks implies those averages are not significantly different.

Table 5.7 Average Composition of Repriceable Liabilities (as a Percentage of Earning Assets) by Crop Reporting District and Maturity Category for the Second Quarter of each Year, 1984-86

Maturity category	NE & NC 1984	NE & NC 1985	NE & NC 1986	EC & SE 1984	EC & SE 1985	EC & SE 1986	C & SC 1984	C & SC 1985	C & SC 1986	NW & W 1984	NW & W 1985	NW & W 1986
Time Certificate of Deposits												
1day	0.15	0.08	0.03	0.00	0.00	0.03	0.04	0.00	0.04	0.00	0.00	0.66
<3m	2.72	3.06	2.44	2.01	2.34	2.37	4.56*	4.14	3.73	3.91	4.68	4.52
3-6m	2.57	1.96	1.73	1.16	1.81	1.91	2.52	2.79	2.54	4.78*	3.11	2.75
6-12m	0.75	0.78	0.73	0.89	0.89	0.94	0.39	0.73	0.76	0.71	0.94	1.29
1-5yr	0.05	0.44	0.25	0.17	0.30	0.33	0.43	0.31	0.20	0.39	0.71	0.69
>5yr	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	6.24	6.33	5.19	4.25	4.71	4.86	7.90	7.97	7.23	9.79*	9.44*	9.91*
All Other Time Deposits												
1day	24.55	21.44	23.46*	25.59	30.89*	38.25	26.77	20.87	32.64*	34.58	36.48*	41.98**
<3m	16.29	16.68	14.88	17.49	18.15*	15.42	19.73*	20.71**	16.65**	12.72**	13.47	11.69
3-6m	16.12*	12.95	14.16	15.18	13.68	13.73	16.38*	15.03	15.64*	13.22	12.96	11.35
6-12m	10.28	7.73*	7.72	9.37	5.75	7.61	8.30	4.27	7.11	8.21	4.76	6.30
1-5yr	12.71*	16.87*	16.66*	10.79	13.44	12.77	10.54	13.52	12.52	8.18	9.62	9.33
>5yr	0.00	0.00	0.02	0.03	0.16	0.15	0.03	0.00	0.01	0.16	0.05	0.01
Total	79.95	75.67	76.90	78.49	82.07	87.93	81.75	74.40	84.57	77.07	77.34	80.66
Nondeposit Interest-Bearing Liabilities												
1day	0.54	0.00	0.00	0.15	0.36	0.32	0.22	0.08	0.10	0.82	0.45	0.67
<3m	0.01	0.00	0.12	0.43	0.25	0.36	0.26	1.51	0.01	1.22*	1.85	1.43*
3-6m	0.00	0.00	0.00	0.07	0.14	0.00	0.23	0.03	0.06	0.00	0.00	0.00
6-12m	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.00	0.00	0.00
1-5yr	0.00	0.00	0.00	0.23	0.00	0.14	0.00	0.00	0.00	0.01	0.00	0.00
>5yr	0.00	0.00	0.00	0.04	0.16	0.15	0.00	0.00	0.00	0.12	0.10	0.08
Total	0.55	0.00	0.12	0.92	0.92	0.97	0.77	1.62	0.17	2.17	2.40	2.18*

Note : The average of each district were compared by year using the Duncan multiple range test, at 10% level of significance.

An average with an asterisk indicates that it is significantly different from other averages in that maturity category across districts for that year.

Averages of the same maturity category and year with an equal number of asterisks or no asterisks implies those averages are not significantly different.

deposits in 1984-1985, and increased the amount held in 1985-86. Banks in the east central and southeast district increased short-term deposits over the same periods. Banks in all the districts increased long-term deposits in 1984-85, and reduced the amount held in 1985-86. The preceding analysis shows there are differences and similarities in the trend of asset-liability management strategy of banks across the districts.

Asset-liability Composition: 1984-86

The average composition of repriceable assets and liabilities of banks by district and maturity category are reported in Tables 5.6 and 5.7 respectively. The Duncan multiple range test was performed to test if the asset-liability composition of banks across districts are significantly different. Few significant differences were observed which implies location is not an important factor in the composition of assets and liabilities.

From Table 5.6, the total loans for banks in all the districts declined during the 1984 to 1986 period. The trend in total debt securities for banks across the districts in 1984-1986 was the same. Total debt securities declined in 1984-1985, and increased in 1985-86. Banks in the northwest and western district show a different trend over the same period. Total other interest-bearing assets for banks in all the districts increased from 1984 to 1986, except for banks in the central and south central districts.

Examining Table 5.7, banks across the districts show more

across the districts. How well did these banks perform from 1984 to 1986?

Interest Income and Expense: 1984-86

The average income and expense of banks by district for the second quarter of each year from 1984 to 1986 are reported in Table 5.8. Statistical test results indicate few significant differences in the average income and expense of banks across the districts.

The total interest income and total interest expense for banks in all the districts declined during the 1984 to 1986 period. The decline in total interest income was probably due to declining interest rates over the same period, and also because of the reduction in the amount of loans outstanding each year. Total interest expense might have declined not only because interest rates fell, but also because of the conservative behavior of banks as many tried to reduce their costs.

The net interest margin of banks reflects their performance. The net interest margin of banks in the northeast and north central district did not change in 1984-86, and fell by 18.64% in 1985-86. Banks in the east central and southeast district had a 6.44% increase in 1984-85, and a 6.03% decline in 1985-86. Banks in the central and south central district experienced a drop of 0.42% in 1984-85, and a further decline of 6.72% in 1985-86. The interest margin of banks in the northwest and western district dropped by 5.30% in 1985-86, and further declined by 8.66% in 1985-86. From the foregoing, it would

Table 5.8 Average Interest Income and Interest Expense (as a Percentage of Earning Assets) by Crop Reporting District for the Second Quarter of each Year, 1984-86

Crop Reporting District												
NE & NC			EC & SE			C & SC			NW & W			
1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986	
Total Interest Income												
6.27	6.06	5.21	6.04	5.97	5.31	6.18	5.86	5.34	6.46*	6.29	5.45	
% Δ	-3.35	-14.03		-1.16	-11.06		-5.18	-8.87		-2.63	-13.35	
Total Interest Expense												
3.90	3.69	3.29*	3.84	3.64	3.13	3.79	3.48	3.12	3.82	3.51	2.92	
% Δ	-5.38	-10.84		-5.21	-14.01		-8.18	-10.34		-8.12	-16.81	
Net Interest Margin												
2.37	2.37	1.92	2.20	2.33	2.18	2.39	2.38	2.22	2.64*	2.78*	2.53*	
% Δ	0.00	-18.64		+6.44	-6.03		-0.42	-6.72		-5.30	-8.66	
Total Noninterest Income												
0.31	0.27	0.37	0.46	0.29	0.27	0.29	0.29	0.27	0.34	0.34	0.34	
% Δ	-12.90	+37.04		-36.96	-6.90		0.00	-6.90		0.00	0.00	
Total Noninterest Expense												
1.33	1.36	1.40	1.32	1.33	1.45	1.30	1.40	1.62	1.75	1.85*	1.72	
% Δ	+2.25	+2.94		+0.76	+9.02		+7.69	+15.71		+5.71	-7.03	
Net Income (Loss)												
0.85	0.49	0.23	0.63	0.70	0.00	0.91	0.66	0.13	0.76	0.97*	0.80	
% Δ	-42.35	-53.06		+11.11	-100.00		-27.47	-80.30		+21.65	-17.53	

appear that banks across districts performed differently.

Results of this analysis seem to indicate that banks in the east central and southeast district performed better than banks in the other districts. They were followed by banks in the central and south central district, northwest and western district, and northeast and north central district, respectively.

Conclusion

The results from the analysis of the asset-liability management strategy, and asset-liability composition of banks across districts show that there were differences and similarities in the trends of management and composition during the 1984 to 1986 period. Trends in the management and composition of the asset portfolios were more identical for banks across the districts when compared to the liability portfolios. This is contrary to expectations because liabilities are more likely to be similar in all the districts than are assets. Loans are more region specific because borrowers in an area have primarily only local lenders as sources of funds. Because banks are largely price takers, to keep deposits each bank must offer competitve products and rates. This implies that liabilities across districts are more likely to be similar than are assets.

Bank performance was different in each district. Some banks performed better than others. This result could relate to the performance of farms in each district. Banks located in a region that have greater economic viability supposedly should perfom better than

others.

Judging by the results from the growth (decline) in net interest margin, banks in the east central and southeast districts performed better than banks in the other districts.

interest rate risk when duration gap is equal to zero. The decision of which risk management strategy to use depends on management policies, available trained personnel, and cost.

The first part of this chapter presents evidence of interest rate risk exposure and management practices at banks in South Dakota by asset size groups from 1984 to 1986. The most direct method to evaluate risk management is to examine the gap and duration gap of a bank. Since the data available is not adequate to compute duration gap, only gap will be calculated. Also, an analysis of the income statements of banks would reveal much about the exposure of banks to interest rate risk.

Interest Income, Interest Expense and Net Interest Margin

The average total interest income, total interest expense, and net interest margin of banks by size groups for the second quarter of each year from 1984 to 1986 are presented in Table 6.1. The Duncan multiple range test indicates that average total interest income of banks by size is not significantly different, except for banks with assets between $10 and $25 million in 1984. Despite the results of the statistical test, there are observable differences in the interest income, interest expense, and interest margin of banks by size. Interest income and expense for banks in each size group declined during the 1984-86 period.

Banks with less than $10 million in assets had a difference of 0.06 percentage points in interest income in 1984-85, and 0.52

Table 6.1

Average Total Interest Income (as a Percentage of Earning Assets) by Bank Size for the Second Quarter of each Year, 1984-86

	Bank Size			
Year	A<$10million	$10<A>$25million	$25<A>$50million	A>$50million
1984	6.06	6.48*	6.05	5.93
1985	6.00	6.22	5.97	5.77
1986	5.48	5.44	5.00	5.52
Average Total Interest Expense (as a Percentage of Earning Assets)				
1984	3.67	3.86	3.81	3.96
1985	3.57	3.56	3.61	3.63
1986	3.04	3.04	3.19	3.20
Average Net Interest Margin (as a Percentage of Earning Assets)				
1984	2.39	2.62*	2.24	1.97
1985	2.43	2.66*	2.36	2.14
1986	2.44	2.40	1.81*	2.32

percentage points difference in 1985-86. Banks with assets between $10 and $25 million had a difference of 0.26 percentage points in 1984-85, and 0.78 percentage points difference in 1985-86. Total interest income declined by 0.08 percentage points in 1984-85 for banks with assets between $25 and $50 million, and also declined 0.97 percentage points in 1985-86. Those with greater than $50 million in assets had a difference of 0.16 percentage points in 1984-85, and 0.25 percentage points difference in 1985-86. Based on the annual variation in total interest income of banks by size from 1984 to 1986, it would appear that interest income was somewhat more stable at banks with assets greater than $50 million when compared to the other groups of banks. This group of banks is followed by the other size groups, in the following order: banks with assets less than $10 million; those with assets between $10 and $25 million; and finally, the group with assets between $25 and $50 million.

Total interest expense for all size groups declined from 1984 to 1986. Statistical test results indicate average total interest expense by bank size are not significantly different. From this data, banks with less than $10 million in assets had a difference of 0.10 percentage points in 1984-85, and 0.53 percentage points difference in 1985-86. Those with assets between $10 and $25 million had a difference of 0.30 percentage points in 1984-85, and 0.52 percentage points in 1985-86. Banks with assets between $25 and $50 million had a difference of 0.20 percentage points in 1984-85, and 0.42 percentage points in 1985-86; while those with greater than $50 million in assets

had a difference of 0.33 percentage points in 1984-85, and 0.43 percentage points in 1985-86.

Also based on the annual variation in interest expense during the 1984 to 1986 period, this component was better managed at banks with less than $10 million in assets, followed by the size group with assets between $25 and $50 million, $10 and $25 million, and greater than $50 million, respectively.

Focusing on the annual change in net interest margin of banks by size, interest margin increased from 1984-1986 for banks with less than $10 million in assets, and those with assets greater than $50 million. Banks with assets between $10 and $25 million and those with assets between $25 and $50 million, had an increase in 1984-85 and a decrease in 1985-86.

Statistical test results indicate few significant differences in net interest margin of banks by size. Average net interest margin is significantly different for banks with assets between $10 and $25 million in 1984 and 1985, and those with assets between $25 and $50 million in 1986. The net interest margin of banks with less than $10 million in assets increased by 0.04 percentage points in 1984-85, and 0.01 percentage point in 1985-86. Those with assets between $10 and $25 million had an increase of 0.04 percentage points in 1984-85, and 0.26 percentage points (decline) in 1985-86. Banks with assets between $25 and $50 million had an increase of 0.12 percentage points in 1984-85, and 0.55 percentage points (decline) in 1985-86. Banks with greater than $50 million in assets had an increase of 0.17 percentage

points in 1984-85, and a further increase of 0.18 percentage points in 1985-86.

Based on the annual variation in net interest margin, it would appear that interest margin was more stable for banks with greater than $50 million in assets. This group is followed by those with assets less than $10 million, bank groups with assets between $10 and $25 million, and $25 and $50 million, respectively. The annual change in net interest margin of banks in each size group from 1984-86 reflect their degree of exposure to interest rate risk.

Judging from the preceding results, banks with greater than $50 million in assets appeared to be the least exposed to interest rate risk, compared to the other size groups, because of the growth of their net interest margin in the 1984-86 period. This group is followed by banks with less than $10 million in assets, $10-$25 million, and $25-$50 million, respectively.

Though other factors could account for the differences in net interest margin of banks by size, the factor which probably had a substantial influence is interest rate risk management practices. The preceding analysis shows that banks in South Dakota were exposed to interest rate risk to different degrees. This implies banks of different sizes use different management practices to hedge against interest rate risk. The gap management of banks by size will be analyzed in the next section.

Gap Management

Gap management is used by most commercial banks and similar institutions to improve their performance. As noted earlier, a 1986 survey of South Dakota banks found that eighty percent use gap management to limit their exposure to interest rate risk. When interest rates were highly volatile and fluctuated rapidly in the 1970's and early 1980's, gap management became important in reducing interest rate risk and achieving acceptable bank performance.

According to Goodman and Langer (1983), financial institutions are subject to interest rate risk because they cannot and do not wish to match perfectly the repricing dates (or rollover periods) on their assets with the repricing dates (or rollover periods) on their liabilities. Using gap analysis, a financial institution can identify the interest rate mismatch on its balance sheet. With assets and liabilities classified into maturity categories, unmatched asset and liabilities within each repricing period can be determined and the impact on profitability under various interest rate scenarios examined.

A financial institution can be liability sensitive or asset sensitive, based on gap management strategy. A liability sensitive institution holds assets of a longer repricing period than the repricing period on liabilities and an asset sensitive institution hold assets of a shorter repricing period than the repricing period on liabilities.

Gap is defined as rate sensitive assets minus rate sensitive

liabilities. An asset and liability are rate sensitive if the rates they bear are adjusted simultaneously as interest rates change. When a financial institution holds a liability sensitive position, it is helped by falling interest rates and hurt by rising interest rates; but with an asset sensitive position, it is helped by rising interest rates and hurt by falling interest rates.

Results from an analysis of the trend in market interest rates from 1984 to 1986 in chapter four were that rates declined during this period. The gap management strategy of banks in South Dakota from 1984 to 1986 can now be evaluated.

Comparison of Gap Management Strategy: 1984-86

Table 6.2 presents the composition of rate sensitive assets and rate sensitive liabilities by maturity category of banks by size group for the second quarter of each year from 1984 to 1986.

Statistical test results indicate there are significant differences in the composition of rate sensitive assets across banks by size. This implies size is a factor in the composition of rate sensitive assets. For banks in each size group, the composition of rate sensitive assets each year was less concentrated in the 6-12 month and greater than 5 year maturity categories, and highly concentrated in the 1-5 year maturity category except for banks with greater than $50 million in assets in the greater than 5 year maturity category.

Examining the composition of rate sensitive assets by maturity categories across the size groups, there are differences and similari-

Table 6.2 Average Composition of Repriceable Rate Sensitve Assets (as a Percentage of Earning Assets) by Bank Size and Maturity Category for the Second Quarter of each Year, 1984-86

Bank Size

Maturity category	A<$10million			$10<A>$25million			$25<A>$50million			A>$50million		
	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
1day	1.42	2.03	1.37	2.08	2.74	3.09	3.63	4.52	6.19	9.10*	11.74*	11.63*
<3m	1.64	1.48	1.61	2.42	2.58	2.34	8.25*	9.44*	6.01*	10.26*	11.75*	12.85**
3-6m	1.21	1.13	0.94	2.71	2.47	2.60	4.98*	5.29*	4.11*	9.39**	9.05**	8.11**
6-12m	0.39	0.62	0.65	2.03	1.63	1.92	3.38*	2.89*	3.51*	8.38**	8.96**	8.01**
1-5yr	1.57	1.56	2.12	3.99	4.08	4.21	9.19*	8.99*	10.98*	23.74**	23.65**	23.99**
>5yr	0.08	0.09	0.27	1.40	1.41	1.77	3.99*	4.24*	4.99*	14.53**	12.22**	11.72**
Total	6.31*	6.91*	6.96*	14.63**	14.91**	15.93**	33.42***	35.37***	35.79***	75.40****	77.37****	76.31****
Average Composition of Repriceable Rate Sensitive Liabilities (as a Percentage of Earning Assets)												
1day	2.54	1.90	2.60	3.56	4.04	5.14	10.04*	9.82*	12.04*	16.72*	25.33**	29.87**
<3m	1.21	1.55*	1.35	2.93	3.29*	3.03	6.96*	7.76***	6.63*	15.41**	15.89**	14.39**
3-6m	1.26*	1.23*	1.19*	2.76**	2.53**	2.54**	5.57***	5.64***	6.20***	12.18****	10.74	10.62****
6-12m	0.64	0.38	0.55	1.42	0.99	1.19	3.31*	2.53*	3.45*	6.79**	5.29**	6.06**
1-5yr	0.89	1.36	1.08	1.31	1.68	1.99	3.88*	5.49*	5.22*	9.84**	11.38**	10.49**
>5yr	0.00	0.00	0.00	0.01	0.00	0.01	0.04	0.03	0.04	0.14*	0.46*	0.19*
Total	6.54	6.42	6.77	11.99	12.53	13.90	29.80*	31.27*	33.58*	61.08**	69.09**	71.62**

Note: The rate sensitve assets and liabilities of each size group were compared by year using the Duncan multiple range test, at 10% level of significance.

Rate sensitve assets and liabilities with an asterisk indicates that they are significantly different from other rate sensitve assets and liabilities in that maturity category across the district for that year.

Rate sensitve assets and liabilities of the same maturity category and year with an equal number of asterisks implies that they are not significantly different.

ties in the trend of composition from 1984 to 1986. Total rate sensitive assets increased each year for all size groups. The data also shows that the larger banks have a greater percentage of rate sensitive assets.

Statistical test results show that banks of different sizes had significantly different compositions of rate sensitive liabilities. Rate sensitive liabilities were less in the 6-12 month and greater than 5 year maturity categories, and highly concentrated in the 1-5 year maturity category in all size groups from 1984 to 1986. There are differences and similarities in the trend of the composition of rate sensitive liabilities. Total rate sensitive liabilities increased in each size group during this period, except for banks with less than $10 million in assets in 1984-85. The larger banks have a greater percentage of rate sensitive liabilities. The differences in the gap management strategy across bank groups are a reflection of the differences in the composition of rate sensitive assets and liabilities.

The gap positions of banks by size group and maturity category from 1984-86 are reported in Table 6.3. Statistical test results indicate there are significant differences in the gap of banks by size, which implies size is a factor in gap management. Banks with less than $10 million in assets had a negative gap in the 1-day, 3-6 month, and 6-12 month maturity categories in 1984; a negative gap in the less than 3 month and 6-12 month maturity categories in 1985; and a negative gap in the 1-day and 3-6 month maturity categories in 1986; and a positive gap in the other maturity categories during each period.

Table 6.3 Gap by Maturity Category and Bank Size (in millions) for the Second Quarter of each Year, 1984-86

Bank Size

	A<$10million			$10<A>$25million			$25<A>$50million			A>$50million		
Maturity Category	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
1day	-1.11	0.12*	-1.23	-1.47	-1.30	-2.04	-6.41	-5.29	-5.85	-7.62	-13.59**	-18.24*
<3m	0.42	-0.07*	0.26	-0.50	-0.71	-0.62	1.29	1.68*	-0.68	-5.15*	-4.14	-1.53
3-6m	-0.04	-0.09	-0.24*	-0.05	-0.05*	0.05	-0.58	-0.34	-2.09	-2.79	-1.69	-2.52
6-12m	-0.25	0.23	0.10	0.07	0.64	0.73	0.61	0.35	0.06	1.59	3.67*	1.94*
1-5yr	0.68	0.20	1.04	2.68	2.40	2.21	5.31*	3.50	5.75*	13.90**	12.26**	13.50**
>5yr	0.08	0.09	0.27	1.39	1.40	1.75	3.95*	4.20*	4.95*	14.38**	11.75**	11.52**
Total	-0.30	0.48	0.20	2.12	2.38	2.08	4.17	4.10	2.14	14.31*	8.26*	4.67*

Note : The gap of each size group were compared by year using the Duncan multiple range test, at 10% level of significance.

Gap with an asterisk indicates that it is significantly different from other gap in that maturity category across bank size for that year.

Gap of the same maturity category and year with an equal number of asterisks or no asterisks implies they are not significantly different.

The gap management strategy of banks with assets between $10 and $25 million in 1984 and 1985 was a negative gap in the 1-day, less than 3 month, and 3-6 month maturity categories; and a positive gap in the other maturity categories. In 1986, the 1-day and less than 3 month maturity categories had a negative gap, and a positive gap in the other maturity categories. As for banks with assets between $25 and $50 million, there was a negative gap in the 1-day and 3-6 month maturity categories in 1984 and 1985; and a positive gap in the other maturity categories. In 1986, the 1-day, less than 3 month, and 3-6 month maturity categories had a negative gap; and a positive gap in the other maturity categories.

Banks with greater than $50 million in assets had a negative gap in the 1-day, less than 3 month, and 3-6 month maturity categories each year from 1984 to 1986; and a positive gap in the other maturity categories. This size group was the only group of banks that had a consistent pattern of gap management strategy by maturity category from 1984-86. The preceding analysis indicates that there were identical patterns and differences in gap management strategy by maturity categories across banks by size, during the period of 1984-86.

Banks of all size groups were liability sensitive from 1984 to 1986 as indicated by total gap, except for banks with assets less $10 million in 1984. A liability sensitive strategy implies a bank had more assets of longer repricing periods than liabilities. This strategy seems appropriate because interest rates declined during this period. When interest rates fall, a bank is helped by being liability

sensitive.

The net interest margin of banks in each size group would be expected to increase from 1984 to 1986 because of their liability sensitive management strategy. As reported by the data in Table 6.1, this was the situation for banks with assets less than $10 million, and assets greater than $50 million from 1984-86. But banks with assets between $10 million and $25 million and those with assets between $25 and $50 million, had an increase in 1984-85 and a decrease in 1985-86, despite their liability sensitive position in 1985-86. This result indicates that banks were exposed to interest rate risk to different degrees.

The data in Table 6.1 and 6.3 show that banks with assets between $10 and $25 million and those with assets between $25 and $50 million were more exposed to interest rate risk during the period of 1984-86; and those with assets less than $10 million, and assets greater than $50 million were less exposed to interest rate risk in this same period.

Conclusion

The first part of this chapter examined and analyzed the interest rate risk exposure and management strategy of banks by asset size from 1984 to 1986. Statistical test results indicate size is a factor in the composition of rate sensitive assets, rate sensitive liabilities, and gap. Results from the data analysis indicates there were identical patterns and differences in gap management strategy

across size groups from 1984 to 1986.

Banks of all size groups were liability sensitive in the period of 1984-86, except for banks with assets less than $10 million in 1984. This was an appropriate strategy because interest rates generally declined in this same period. The market value of their portfolio will increase. Based on the results from the net interest margin trend and gap management strategy analysis, it was concluded that banks of all size groups were exposed to interest rate risk to different degrees. Banks with greater than $50 million in assets were the least exposed, followed by those with less than $10 million in assets, those with assets between $10 and $25 million and finally, those with assets between $25 and $50 million.

The second part to this chapter will analyze interest rate risk exposure and management strategy of banks by crop reporting district.

Interest Rate Risk Management Strategy by Crop Reporting District

Its reasonable to hypothesize that since banks in various locations (or geographical markets) are faced with different economic conditions, based on the economic performance of agriculture in each region, their exposure to interest rate risk might differ. If their exposure to interest rate risk is different, their interest rate risk management strategy may also be different. The income statement data, and the gap of banks from 1984 to 1986 will be analyzed in order to evaluate risk exposure and management strategy by crop reporting district.

Interest Income, Interest Expense and Net Interest Margin

The average total interest income, total interest expense, and net interest margin of banks, by size during the second quarter of each year from 1984 to 1986 are presented in Table 6.4. Statistical test results indicate few significant differences in total interest income, total interest expense, and net interest margin of banks across the districts. Total interest income and total interest expense of banks by district declined during this period. For banks in the northeast and north central district, interest income fell by 0.21 percentage points in 1984-85, and 0.85 percentage points in 1985-86. Those located in the east central and southeast district had a difference of 0.07 percentage points in 1984-85, and 0.66 percentage points in 1985-86.

Table 6.4

Average Total Interest Income (as a Percentage of Earning Assets) by Crop Reporting District, for the Second Quarter of each Year, 1984-86

	Crop Reporting District			
	NE & NC	EC & SE	C & SC	NW & W
1984	6.27	6.04	6.18	6.46*
1985	6.06	5.97	5.86	6.29
1986	5.21	5.31	5.34	5.45
Average Total Interest Expense (as a Percentage of Earning Assets)				
1984	3.90	3.84	3.79	3.82
1985	3.69	3.64	3.48	3.51
1986	3.29*	3.13	3.12	2.92
Average Net Interest Margin (as a Percentage of Earning Assets)				
1984	2.37	2.20	2.39	2.64*
1985	2.37	2.33	2.38	2.78*
1986	1.92	2.18	2.22	2.53*

As for banks in the central and south central district, interest income declined by 0.32 percentage points in 1984-85, and 0.52 percentage points in 1985-86. And finally, banks in the northwest and western district had a difference of 0.17 percentage points in 1984-85, and 0.84 percentage points in 1985-86.

Total interest income declined because interest rates fell during this period. Judging by the variation in interest income of banks by district, it would appear interest income was more stable in the east central and southeast district, followed by the central and south central, the northwest and western, and the northeast and north central districts, respectively.

The average total interest expense from 1984 to 1986 also declined. The interest expense of banks in the northeast and north central district fell by 0.21 percentage points in 1984-85, and 0.40 percentage points in 1985-86. Banks in the east central and southeast had a difference of 0.20 percentage points in 1984-85, and 0.51 percentage points in 1985-86. Banks in the central and south central district had a difference of 0.31 and 0.36 percentage points in 1984-85 and 1985-86, respectively. As for banks in the northwest and western district, interest expense declined by 0.31 percentage points in 1984-85, and 0.59 percentage points in 1985-86.

Also judging from the variation in total interest expense, it appears this component was better managed at banks in the northwest and western district, followed by those in the other districts in the following order: the east central and southeast, the central and south

central, and the northeast and north central.

Average net interest margin, an index of bank performance, did not change for banks in the northeast and north central district in 1984-85, and fell by 0.45 percentage points in 1985-86. For banks located in the east central and southeast, interest margin increased by 0.13 percentage points in 1984-85, and declined by 0.15 percentage points in 1985-86. Banks in the central and south central district experienced a drop in interest margin of 0.01 percentage points in 1984-85, and a further decline of 0.16 percentage points in 1985-86. The interest margin of banks in the northwest and western district declined by 0.14 percentage points in 1984-85, and declined further by 0.25 percentage points in 1985-86.

Judging by these results, banks in various locations were affected differently by fluctuating interest rates, indicating that they were exposed to different degrees of risk. Banks in the east central and southeast district coped better than banks in the other districts in minimizing the threat of interest rate risk during this period. They were followed by banks in the central and south central district, the northwest and western, the northeast and north central districts, respectively.

The difference in the trend of net interest margin of banks by district reflects the differences in their risk management practices. The differences in the risk management practice of banks by crop reporting district can be analyzed by calculating their gap.

Gap Management by Crop Reporting Districts

The average composition of rate sensitive assets and rate sensitive liabilities of banks for the second quarter of each year from 1984 to 1986 by crop reporting district is presented in Table 6.5. Statistical test results indicate the composition of rate sensitive assets and liabilities by crop reporting district are significantly different particularly the composition of rate sensitive liabilities.

There are also similarities in the trend of the composition of rate sensitive assets during this period. The 1-5 year maturity category of rate sensitive assets of banks by district was greater than the other maturity categories in each year. Also, the total rate sensitive assets increased from 1984 to 1986, except for banks in the northeast and the north central district with a small decrease in 1985-86.

The trend in the composition of rate sensitive liabilities is similar to that of rate sensitive assets. There are differences and similarities in the composition of rate sensitive liabilities of banks by maturity category in each year. The similarities that can be observed are: the greater than 5 year rate sensitive liabilities were smaller than the other categories each year in all the districts; also, total rate sensitive liabilities increased every year for all banks.

The differences and similarities in the composition of rate sensitive assets and rate sensitive liabilities of banks in each district from 1984-86 should be reflected in their gap.

Table 6.5 Average Composition of Repriceable Rate Sensitve Assets (as a Percent of Earning Assets) by crop Reporting District and Maturity Category for the Second Quarter of each Year, 1984-86

	Crop Reporting District											
	NE & NC			EC & SE			C & SC			NW & W		
Maturity Category	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
1day	2.44	3.41	3.95	3.86	5.53	7.64	3.21	2.26	2.57	3.82	6.47	6.67
<3m	4.95	4.09	3.72	6.06	6.68	4.39	6.27	9.84*	9.24*	3.65	3.85	4.03
3-6m	3.43	3.89	3.48	3.32	3.93	3.69	6.13*	5.86*	5.14*	3.81	3.21	3.11
6-12m	3.19	2.67	2.85	3.27	3.06	3.18	3.02	3.49	4.25	2.76	2.60	3.10
1-5yr	6.22	6.34	6.66	8.50	9.01*	10.75	9.72*	10.08**	13.70*	6.82	7.21	7.24
>5yr	2.72	3.26	2.64	5.07	5.56*	5.82	4.36	3.81	6.35*	2.42	2.00	2.54
Total	22.97	23.66	23.30	30.08*	33.77*	35.47*	32.71*	35.34*	41.25*	23.28	25.34	26.69
Average Composition of Repriceable Rate Sensitive Liabilities (as a Percentage of Earning Assets)												
1day	4.66	4.32	4.61*	6.94	12.62*	15.28	8.86*	7.58	13.61	8.40	9.70	11.66**
<3m	4.41*	4.74	4.43*	6.21	7.03*	6.63	7.64	8.91**	8.20	4.13**	4.83	4.60*
3-6m	4.07	3.42	3.82	4.80	5.06*	5.09*	5.81*	5.66**	7.15**	4.03	4.16	3.76
6-12m	2.43	2.54*	2.23	3.01	2.24	3.09	2.71	1.60	2.97	2.24	1.70	2.31
1-5yr	3.06*	4.24	4.32	3.31	4.56	4.33	3.93	5.43*	5.96*	2.22*	2.91	2.99
>5yr	0.02	0.01	0.01	0.06	0.22	0.13*	0.01	0.00	0.00	0.00	0.06	0.05
Total	18.65	19.27	19.42	24.33*	31.73*	34.65*	28.99**	29.18**	37.89*	21.02	23.35	25.37

Note: Rate sensitive assets and liabilities of each district were compared by year using the Duncan multiple range test, at 10% level of significance.

Rate sensitve assets and liabilities with an asterisk indicates they are significantly different from other rate sensitive assete and liabilities in that maturity category across the districts for that year.

Rate sensitve assets and liabilities of the same maturity category and year with an equal number of asterisks or no asterisks implies they are not significantly different.

Table 6.6 presents the gap of banks by maturity category and crop reporting district for the second quarter of each year from 1984 to 1986. Statistical test results indicate few significant differences in the gap of banks by maturity category across districts by year. Banks in the east central and southeast district, along with those in the northwest and western district, had similar trends in gap positions during the period of 1984 to 1986. From Table 6.1, these two districts also had similar trends in net interest margin from 1984 to 1986. Both districts had a negative gap in the 1-day, less than 3 month, and 3-6 month maturity categories and a positive gap in the other maturity categories. In Table 6.6, the total gap of both districts declined each year during this period.

Banks in the northeast and north central district had different negative gap positions each year, which implies their interest rate risk management strategy changed during this period. Total gap increased in 1984-85, and decreased in 1985-86.

Banks in the central and south central district also show different negative gap positions each year, indicating a different strategy to control interest rate risk. Their total gap increased in 1984-85, and decreased in 1985-86.

Banks in each crop reporting district were liability sensitive during the period of 1984 to 1986 as indicated by total gap. This was an appropriate strategy because of the declining trend in interest rates during this period. A liability sensitive position implies assets of longer repricing periods outnumbered repricing liabilities

Table 6.6 Gap (in millions) by Crop Reporting District and Maturity Category, for the Second Quarter of each Year, 1984-86

Crop Reporting District

	NE & NC			EC & SE			C & SC			NW & W		
Maturity Category	1984	1985	1986	1984	1985	1986	1984	1985	1986	1984	1985	1986
1day	-2.22	-0.90*	-0.66*	-3.08	-7.09	-7.63	-5.64	-5.31	-11.04	-4.58	-3.23	-4.98**
<3m	0.54	-0.64	-0.70	-0.15	-0.34	-2.23	-1.36	0.93	1.04*	-0.48	-0.98	-0.57
3-6m	-0.65	0.46	-0.34	-1.47	-1.12	-1.39	0.32	0.20	-2.01	-0.21	-0.95	-0.64
6-12m	0.76	0.13	0.62	0.25	0.81	0.09	0.31	1.89*	1.27	0.52	0.89	0.79
1-5yr	3.16	2.10*	2.32	5.19	4.45	6.41*	5.78*	4.65	7.74*	4.60	4.29	4.24
>5yr	2.71	3.25	2.62	5.01	5.34*	5.69	4.34	3.81	6.34*	2.35	1.94	2.50
Total	4.30	4.40	3.83	5.75	2.05	0.94	3.75	6.17	3.34*	2.20	1.96	1.34

Note : The gap of each district were compared by year using the Duncan multiple range test, at 10% level of significance.

Gap with an asterisk indicates that it is significantly different from other gap in that maturity category across the districts for that year.

Gap of the same maturity category and year with an equal number of asterisks or no asterisks implies those gap are not significantly different.

held by banks. As a result, the market value of their portfolio will increase because in this situation assets are less interest-elastic than liabilities.

Conclusion

Though other factors could account for the trend in net interest margin, the most important factors are the movements in interest rates and interest rate risk management strategy. Because interest rates declined from 1984 to 1986, the liability sensitive positions of banks during this period in each district was an appropriate strategy.

From the analysis of Tables 6.4, 6.5, and 6.6, banks across districts were exposed to interest rate risk to different degrees, based on their net interest margin trend from 1984 to 1986. Banks in the east central and southeast districts were less exposed to interest rate risk when compared to banks in the other districts during this period. There were also similarities and differences in the composition of rate sensitive assets and rate sensitive liabilities. The different gap positions of banks from 1984 to 1986 indicate that there were differences in management strategy in controlling their exposure to interest rate risk.

CHAPTER VII

Summary, Implications, Limitations, and Recommendations

Introduction — Obecjectives and Procedures

This research was conducted in order to evaluate the asset-liability management strategy and the interest rate risk of banks in South Dakota, from 1984 to 1986. The specific objectives were:

1. To examine and analyze the trends in market interest rates from 1984 to 1986.

2. To evaluate and compare the asset-liability management strategy and composition of banks by asset size.

3. To evaluate and compare the asset-liability management strategy and composition of banks by crop reporting distict.

4. To examine, analyze and compare interest rate risk exposure of banks by asset size, and by crop reporting districts.

Forty-four banks were chosen with total assets in the range of about $5 million to over $140 million. These sample banks were grouped into four asset size category: less than $10 million; $10-$25 million; $25-$50million; and greater than $50 million. In order to compare banks by districts, banks were grouped into four substate regions based on similarities in crop production patterns across the State. These substate regions are: (1) Northeast and North Central CRD's; (2) East Central and Southeast CRD's; (3) Central and South Central CRD's; (3)

Northwest and Western CRD's.

The Duncan multiple range test, at 10% significance level, was used to test the significance of the effect of size and location in the composition of assets and liabilities. The comparison of asset-liability management strategy, asset-liability composition, and bank performance by size and location was done by observing the trends of these portfolios from 1984 to 1986. The variation in net interest margin was used as a gauge to determine the interest rate risk of banks by size and location.

Findings

Interest Rate Trend: 1984-86

Interest rates declined after the third quarter of 1984. This was probably the result of increased competition due to deregulation, policies adopted by the Federal Reserve, general activities in the economy, increased purchases of U.S securities, and the low demand of investment funds by the private sector.

Rates were more volatile in 1984, especially in the fourth quarter. After the fourth quarter of 1984, interest rate volatility was relatively low.

Asset-liability Management Strategy/Composition of Banks by Size

The trend in the short-term and long-term debt securities and deposits of banks by size were examined in order to evaluate and

compare their asset-liability management strategy from 1984 to 1986. Results from the analysis of the trends in management strategies during this period indicate that the asset-liability management strategies of banks by size were different.

Comparing trends in the composition of assets and liabilities, it was also found that banks by size had different compositions. Using the Duncan multiple range test to determine if size was a factor in the composition of assets and liabilities, results show few significant differences. This implies that size is a factor, but not the major factor explaining the differences in the asset-liability composition of banks.

The interest income and interest expense of banks in all size groups declined from 1984 to 1986 except for banks with assets greater than $50 million that had an increase during the 1984-85 period. Based on this trend and the growth (decline) in interest income and net interest margin, it was suggested that banks of all size groups had a poor performance from 1984 to 1986 though some groups performed better than others.

Asset-Liability Management Strategy/Composition by District

Differences and similarities were observed in the asset-liability management strategies and asset-liability composition of banks by crop reporting district from 1984 to 1986. This observation was based on the trends in the short-term and long-term loans and deposits, and the trends in the composition of assets and liabilities

over the same period.

Banks in each region performed differently from 1984 to 1986. All districts showed poor performances during this period, based on the growth (decline) in interest income and net interest margin.

Interest Rate Risk Exposure and Management

Eighty percent of banks in South Dakota use gap management to limit their exposure to interest rate risk. Seventy-five percent of the banks in a 1986 study survey reported matching maturities of groups of assets and liabilities, which is a gap management procedure. Results from the analysis of the gap positions of banks by size and district from 1984 to 1986 indicate otherwise.

If a bank is liability sensitive, it is helped by falling rates, and hurt by rising rates. Likewise, if a bank is asset sensitive, it is hurt by falling rates and helped by rising rates. Generally, interest rates declined during the 1984-86 period. Banks by size and location were liability sensitive over the same period, except for banks with assets less than $10 million in 1984-85.

Based on the variation in net interest margin from 1984 to 1986, it was suggested that banks by size and location were exposed to interest rate risk, and to different degrees. Banks with assets greater than $50 million were less exposed to risks compared to the group of banks. By district, banks in the east central and southeast districts were less exposed to interest rate risk compared to banks in the other districts.

Conclusions and Implications

Because South Dakota's economy is predominantly based on agriculture, banks in this region are faced with the possibility of declining future returns due to the recent farm crisis. During the period of 1984 to 1986, the value of farm assets declined faster than farms debt. assets declined.

With the change in the operating procedures by the Federal Reserve, and the passage of the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) by Congress in 1980, the competition in the banking industry have since increased. As a result, the potential exposure of banks to interest rate risk has also increased.

Given this scenario, it became necessary for banks to adopt management strategies that would limit their risk exposure and improve their performance. Banks in South Dakota tried to limit their exposure to interest rate risk during the period of 1984 to 1986 based on the analysis of their gap positions. Some were more exposed than others.

Limitations

There were two major limitations encountered in this study. First, the data needed to conduct a more rigorous analysis was not available. If adequate data had been obtained, this research could have taken a different approach. For example, models can be developed to examine the asset-liability management and interest rate risk of

banks. Results from such an analysis would indicate precisely which banks by size and region had better performance and are less exposed to risks.

Secondly, the data available were not continuous data, and the period examined was too short. In order to conduct a research of this type and obtain more adequate results, it is necessary to have continuous data that are over a long period, probably five years or more.

Recommendations for Future Research

This study has provided a general understanding that banks in South Dakota by size and location have different asset-liability management strategies and are also exposed to interest rate risks to varying degrees. Further research should examine the gap and duration gap of banks using more adequate data in order to be more precise as to the groups that are more exposed to risks.

BIBLIOGRAPHY

Belongia, Michael T. and R. A. Gilbert. The Farm Credit Crisis: Will It Hurt the Whole Economy? Review, Federal Reserve Bank of St. Louis, Vol. 67, No. 7, Dec. (1985), p. 5-15.

Belongia, Michael T. and G. J. Santoni. Cash Flow or Present Value: What's Lurking Behind That Hedge? Review, Federal Reserve Bank of St. Louis, Jan. (1985), p. 6-13.

Booth, James R. et. al. Use of Interest Rate Futures by Financial Institutions, Journal of Bank Research, Spring (1984), p. 15-20.

Brewer, Elijah. Bank Gap Management and the Use of Financial Futures. Economic Perspectives, Federal Reserve Bank of Chicago, March/April (1985).

Brewer, Elijah III and Cheng Few Lee. How the Market Judges Bank Risk. Economic Perspectives, Federal Reserve Bank of Chicago, Nov/Dec (1986), p. 25-31.

Duncan, David B. Multiple Range and Multiple F Tests, Biometrics, Vol 11, March (1955), p. 1-42.

Drabenstott, Mark and Anne O. McDonley. The Impact of Financial Futures on Agricultural Banks. Economic Review, May (1982), p. 19-29.

Flannery, Mark J. How Do Changes in Market Interest Rates Affect Bank Profits? Business Review, Federal Reserve Bank of Philadelphia, Sept/Oct (1980), p. 13-22.

Flannery, Mark J. Market Interest Rates and Commercial Bank Profitability: An Empirical Investigation. Journal of Finance Vol. XXXVI, No. 6, December (1981), p. 1085-1101.

Flannery, Mark J. Interest Rates and Bank Profitability: Additional Evidence. Journal of Money, Credit and Banking, Vol. 15, August (1983), p. 355-362.

Francis, Jack C. Portfolio Analysis of Asset and Liability Management in Small-, Medium-, and Large-Sized Banks. Journal of Monetary Economics, July (1978), p. 459-480.

Graddy, Duane B. and Adi S. Karna. Net Interest Margin Sensitivity Among Banks of Different Sizes. Journal of Bank Research, Vol. 14, No. 4, Winter (1984), p. 283-290.

Gilbert, R. A. Requiem for Regulation Q: What It Did and Why It Passed Away. Review, Federal Reserve Bank of St. Louis, Vol. 68, Feb (1986), p. 22-37.

Goodman, Laurie S. and Martha J. Langer. Accounting for Interest Rate Futures in Bank Asset-Liability Management. Journal of Futures Markets, Vol. 3, No. 4, Winter (1983), p. 415-427.

Hancock, Diana. Bank Profitability, Interest Rates, and Monetary Policy. Journal of Money, Credit and Banking, Vol. 17, No. 2, May (1985), p. 189-202.

Hanweck, Gerald A. and Thomas E. Kilcollin. Bank Profitability and Interest Rate Risk. Journal of Economics and Business, Vol. 36, Feb (1984), p. 77-84.

Hunter, William C. and Stephen G. Timme. Technical Change, Organizational Form, and the Structure of Bank Production. Journal of Money, Credit, and Banking, Vol. 18, No. 2, May (1986), p. 152-166.

Kaufman, George G. Deregulation and Changes in the Financial Services Industry: Technological and Regulatory Forces in the Developing Fusion of Financial-Services Competition. Journal of Finance, Vol. XXXIX, No. 3, July (1984), p. 759-72.

Kaufman, George G. Measuring and Managing Interest Rate Risk: A Primer. Economic Perspectves, Federal Reserve Bank of Chicago, Jan/Feb (1984), p. 16-29.

Kaufman, George G. and et. al. Consequences of Deregulation for Commercial Banking. Journal of Finance, Vol. XXXIX, No. 3, July (1984), p. 789-803.

Koppenbaver, G. D. Trimming the Hedges: Regulators, Banks, and Financial Futures. Economic Perspectives, Federal Reserve Bank of Chicago, Nov/Dec (1984), p. 3-12.

Merrick, John J. Jr. and Anthony Saunders. Bank Regulation and Monetary Policy. Journal of Money, Credit, and Banking, Vol. 17, No. 4, Part 2, Nov (1985), p. 691-717.

Mitchell, Karlyn. Interest Rate Risk Management at Tenth District Banks. Economic Review, Federal Reserve Bank of Kansas City, May (1985), p. 3-19.

Mitchell, Karlyn. Interest Rate Risk at Commercial Banks: An Empirical Investigation. Research Division, Federal Reserve Bank of Kansas City, Sept. (1985)

Santomero, Anthony M. and Jeremy J. Siegel. Deposit Deregulation and Monetary Policy. Carnegie-Rochester Conference Series on Public Policy, Vol. 24, Spring (1986), p. 179-224.

Simonson, Donald G. and George H. Hempel. Improving Gap Management for Controlling Interest Rate Risk. Journal of Bank Research, Summer (1982), p. 109-15.

South Dakota Agricultural Statistics Services. South Dakota Agricultural Statistics. Sioux Falls, SD, May (1986).

South Dakota Agricultural Statistics Services. South Dakota Agricultural Statistics. Sioux Falls, SD, May,(1987).

Spellman, Lewis J. The Depository Firm and Industry: Theory History and Regulation. Academic Press, New York (1982), p.51-64.

Toevs, Alden L. Gap Management: Managing Interest Rate Risk in Banks and Thrifts. Economic Review, Federal Reserve Bank of San Francisco, Spring (1983), p. 20-25.

Wells, Donald R. and L. S. Scruggs. Historical Insights into the Deregulation of Money and Banking. Cato Journal, Vol. 5, No. 3, Winter (1986), p. 899-910.

Wilson, G. and G. D. Sullivan. Agricultural Banks in the Southeast and Nation: A Study in Contrasts. Southern Journal of Ag. Econ., Vol. 18, No. 1, July (1986), p. 93-101.

APPENDIX

Schedule RC-J—Repricing Opportunities for Selected Balance Sheet Categories

The information required in this schedule represents the distribution across columns A through F of totals reported elsewhere in the Report of Condition. The *totals* being distributed (recorded in column G) *must* match the amounts reported for the corresponding items elsewhere in the Report of Condition as noted for each item. The required matching for each line item is described in the instructions.

Dollar Amounts in Thousands — C150

PART I. SELECTED ASSETS Part I excludes trading account assets and equity securities.	(Column A) Assets with immediately adjustable interest rates or original maturity of one day	Remaining Maturity If Fixed Rate; Earliest Possible Repricing Interval If Floating Rate: (Column B) 3 months or less, excluding amounts reported in column A	(Column C) Over 3 months through 6 months	(Column D) Over 6 months through 12 months	(Column E) Over 1 year through 5 years	(Column F) Over 5 years	(Column G) Total amount to be distributed in columns A through F (see instructions)	
	Mil Thou	Mil Thou	Mil Thou	Mil Thou	Mil Thou	Mil Thou	Mil Thou	
1. All loans and all lease financing receivables other than those in nonaccrual status[1]	(Column G, which must be distributed across columns A through F, must equal the sum of Schedule RC-C, items 1–9, minus Schedule RC-N, item 6, column C.)							
	RCON 1425	RCON 1426	RCON 1427	RCON 1428	RCON 1429	RCON 1431	RCON 1479	1.
2. Debt securities (i.e., U.S. Treasury securities, U.S. Government agency obligations, state and local securities, and other bonds, notes and debentures) . . .	(Column G, which must be distributed across columns A through F, must equal Schedule RC, item 2, minus equity securities (e.g., Federal Reserve stock and corporate stock) included in amount reported in Schedule RC-B, item 3.b, column A, if any.)							
	RCON 1546	RCON 1547	RCON 1548	RCON 1549	RCON 1551	RCON 1552	RCON 0383	2.
3. Other interest-bearing assets (i.e., interest-bearing balances due from depository institutions, federal funds sold, and securities purchased under agreements to resell)	(Column G, which must be distributed across columns A through F, must equal Schedule RC, item 1.b plus item 3.)							
	RCON 1554	RCON 1556	RCON 1557	RCON 1558	RCON 1560	RCON 1561	RCON 1562	3.

[1]Amortizing real estate loans and other multipayment loans (excluding credit cards and related plans) and leases may be spread in item 1 of part I above by selecting one of two methods at the reporting bank's option: (1) by scheduled amortization (*the preferred method*), or (2) by final maturity for fixed rate loans and by earliest repricing opportunity for floating rate loans (*the alternative method*). For amortizing real estate loans and for other multipayment loans and leases, the option may be exercised independently for each loan and lease. When Method (2), the alternative method, is selected, dollar amounts must be reported in memorandum item 2.a or 2.b or both, as appropriate.

For floating rate loans, if Method (1) is selected, the scheduled payments should be spread only up to the earliest repricing opportunity, at which point the total remaining balance should be reported. If Method (2) is selected, the entire balance of such loans should be reported by the earliest repricing opportunity.

Legal Title of Bank

Schedule RC-J—Continued

Memoranda

	Mil	Thou	
1. Fixed rate debt securities with remaining maturity of over 10 years (included in item 2, column F above)			M.1.
	RCON 1553		

2. Additional information required of banks that use Method (2), *the alternative method* (see footnote 1), for reporting amortizing real estate loans and other multipayment loans and leases in part I, item 1 above.
NOTE: Other multipayment loans (excluding credit cards and related plans) are loans, other than those secured by real estate, that according to their original terms, are repayable in at least four substantially equal, regular payments due quarterly or more frequently.
[Banks that report all amortizing real estate loans or all multipayment loans and all leases in item 1 of part I above on the basis of scheduled amortization (Method (1)) must enter N/A in 2.a or 2.b below, as appropriate.]

	(Column A) Estimated regularly scheduled payments received during the calendar quarter ending with the report date		(Column B) Dollar amount outstanding as of the report date for loans and leases reported in part 1, item 1, above, by using Method (2) (the alternative method)		
	Mil	Thou	Mil	Thou	
a. Amortizing real estate loans (complete both columns A and B of this memorandum item)					M.2.a.
	RCON 1378		RCON 1377		
b. Other multipayment loans (excluding credit cards and related plans) and leases (complete both columns A and B of this memorandum item)					M.2.b.
	RCON 1378		RCON 1379		

Dollar Amounts in Thousands

PART II. SELECTED LIABILITIES Part II excludes deposits classified as demand or savings accounts, such as money market deposit accounts.	(Column A) Liabilities with immediately adjustable interest rates or original maturity of one day		Remaining Maturity if Fixed Rate; Earliest Possible Repricing Interval if Floating Rate										(Column G) Total amount to be distributed in columns A through F (see instructions)		
			(Column B) 3 months or less excluding amounts reported in column A		(Column C) Over 3 months through 6 months		(Column D) Over 6 months through 12 months		(Column E) Over 1 year through 5 years		(Column F) Over 5 years				
	Mil	Thou	Mil	Thou	Mil	Thou	Mil	Thou	Mil	Thou	Mil	Thou	Mil	Thou	
1. Time certificates of deposit of $100,000 or more (excluding open-account time deposits of $100,000 or more).	(Column G, which must be distributed across columns A through F, must equal Schedule RC-E, Memorandum item 2.c.)														
	RCON 2699		RCON 2669		RCON 2661		RCON 2662		RCON 2664		RCON 2665		RCON 6645		1.
2. All other time deposits (including all open-account time deposits.	(Column G, which must be distributed across columns A through F, must equal Schedule RC-E, Memoranda items 2.b plus 2.d.)														
	RCON 2666		RCON 2667		RCON 2670		RCON 2671		RCON 2672		RCON 2673		RCON 2677		2.
3. Nondeposit interest-bearing liabilities (i.e., federal funds purchased, securities sold under agreements to repurchase, other borrowed money, and notes and debentures subordinated to deposits)	(Column G, which must be distributed across columns A through F, must equal Schedule RC, item 14 plus item 16 plus item 19.)														
	RCON 2692		RCON 2693		RCON 2695		RCON 2697		RCON 2698		RCON 2701		RCON 2527		3.

Schedule RC-K—Quarterly Averages[1]

Dollar Amounts in Thousands		C155 Mil	C155 Thou	
ASSETS				
1. Interest-bearing balances due from depository institutions	RCON 3381			1.
2. Taxable securities	RCON 3307			2.
3. Securities issued by states and political subdivisions in the U.S.	RCON 3383			3.
4. Federal funds sold and securities purchased under agreements to resell	RCON 3365			4.
5. Loans[2,3]:				
a. Total loans *(to be completed only by those banks with less than $25 million in total assets)*	RCON 3360			5.a.
The following four items are to be completed only by those banks with $25 million or more in total assets.				
b. Real estate loans	RCON 3386			5.b.
c. Installment loans	RCON 3387			5.c.
d. Credit cards and related plans	RCON 3288			5.d.
e. Commercial (time and demand) and all other loans	RCON 3289			5.e.
6. Earning assets	RCON 3402			6.
7. Total assets	RCON 3368			7.
LIABILITIES				
8. Time certificates of deposit of $100,000 or more	RCON 3345			8.
9. All NOW accounts (including "Super NOW" accounts), money market deposit accounts, and time deposits (other than certificates of deposit of $100,000 or more)	RCON 3403			9.
10. Federal funds purchased and securities sold under agreements to repurchase	RCON 3353			10.
Memorandum				
To be completed by banks with $25 million or more in total assets and with loans to finance agricultural production and other loans to farmers (Schedule RC-C, item 3) exceeding five percent of total loans.[3]				
1. Agricultural loans included in items 5.b through 5.e above	RCON 3379			M.1.

[1] For all items, banks have the option of reporting either (1) an average of daily figures for the quarter or (2) an average of weekly figures (i.e., the Wednesday of each week of the quarter). In addition, averages of four month-end figures (the last day of the preceding quarter and of each month of the currently-reported quarter) are allowed for items 2, 3, 5.a through 5.e, 6, 7, and memorandum item 1.

[2] See instructions for loan classifications used in this schedule.

[3] The $25 million asset size test is based on the total assets reported on the June 30, 1985 Report of Condition.

FFIEC 034
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Affix the address label in this space.

Legal Title of Bank

City | County

State | Zip Code

Bank's Transit Number

Consolidated Report of Income
for the period January 1, 1986–March 31, 1986

All Report of Income schedules are to be reported on a calendar year-to-date basis in thousands of dollars.

Schedule RI—Income Statement

Dollar Amounts in Thousands		I180 Mil	I180 Thou	
1. Interest income:				
a. Interest and fee income on loans[1,2]:				
(1) Total loans *(to be completed only by those banks with less than $25 million in total assets)*	RIAD 4010			1.a.(1)
The following four items are to be completed only by those banks with $25 million or more in total assets[1,2]				
(2) Real estate loans	RIAD 4246			1.a.(2)
(3) Installment loans	RIAD 4247			1.a.(3)
(4) Credit cards and related plans	RIAD 4248			1.a.(4)
(5) Commercial (time and demand) and all other loans	RIAD 4249			1.a.(5)
b. Income from lease financing receivables	RIAD 4065			1.b.
c. Interest income on balances due from depository institutions	RIAD 4115			1.c.
d. Interest and dividend income on securities:				
(1) Securities issued by states and political subdivisions in the U.S.	RIAD 4066			1.d.(1)
(2) U.S. Government securities and other securities (debt and equity)	RIAD 4060			1.d.(2)
e. Interest income from assets held in trading accounts	RIAD 4069			1.e.
f. Interest income on federal funds sold and securities purchased under agreements to resell	RIAD 4020			1.f.
g. Total interest income (sum of items 1.a through 1.f)	RIAD 4107			1.g.
2. Interest expense:				
a. Interest on deposits:				
(1) Interest on time certificates of deposit of $100,000 or more	RIAD 4174			2.a.(1)
(2) Interest on other deposits	RIAD 4176			2.a.(2)
b. Expense of federal funds purchased and securities sold under agreements to repurchase	RIAD 4180			2.b.
c. Interest on demand notes issued to the U.S. Treasury and on other borrowed money	RIAD 4185			2.c.
d. Interest on mortgage indebtedness and obligations under capitalized leases	RIAD 4072			2.d.
e. Interest on notes and debentures subordinated to deposits	RIAD 4200			2.e.
f. Total interest expense (sum of items 2.a through 2.e)	RIAD 4073			2.f.
3. Net interest income (item 1.g minus 2.f)	RIAD 4074			3.

[1] See instructions for loan classifications used in this schedule.

[2] The $25 million asset size test is based on the total assets reported on the June 30, 1985 Report of Condition.

Schedule RI—Continued

Dollar Amounts in Thousands	Mil	Thou		
4. Provisions:				
a. Provision for loan and lease losses			RIAD 4230	4.a.
b. Provision for allocated transfer risk			RIAD 4243	4.b.
5. Noninterest income:				
a. Service charges on deposit accounts	RIAD 4080			5.a.
b. Other noninterest income	RIAD 4079			5.b.
c. Total noninterest income (sum of items 5.a and 5.b)			RIAD 4079	5.c.
6. Gains (losses) on securities not held in trading accounts			RIAD 4091	6.
7. Noninterest expense:				
a. Salaries and employee benefits	RIAD 4135			7.a.
b. Expenses of premises and fixed assets (net of rental income) (excluding salaries and employee benefits and mortgage interest)	RIAD 4217			7.b.
c. Other noninterest expense	RIAD 4092			7.c.
d. Total noninterest expense (sum of items 7.a through 7.c)			RIAD 4093	7.d.
8. Income (loss) before income taxes and extraordinary items and other adjustments (item 3 plus or minus items 4.a, 4.b, 5.c, 6, and 7.d)			RIAD 4301	8.
9. Applicable income taxes (on item 8)			RIAD 4302	9.
10. Income (loss) before extraordinary items and other adjustments (item 8 minus 9)			RIAD 4300	10.
11. Extraordinary items and other adjustments:				
a. Extraordinary items and other adjustments, gross of income taxes	RIAD 4310			11.a.
b. Applicable income taxes (on item 11.a)	RIAD 4315			11.b.
c. Extraordinary items and other adjustments, net of income taxes (item 11.a minus 11.b)			RIAD 4320	11.c.
12. Net income (loss) (sum of items 10 and 11.c)			RIAD 4340	12.

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Dollar Amounts in Thousands	Year-to-date Mil	Thou		
1. Interest on all NOW accounts (including "Super NOW" accounts), money market deposit accounts, and time deposits (other than certificates of deposit of $100,000 or more)	RIAD 4508			M.1.
2. Not applicable				
3. Estimated tax-exempt income on loans and leases to states and political subdivisions in the U.S. (excludes tax-exempt income on securities)	RIAD 4313			M.3.
4. Estimated investment tax credit	RIAD 4308			M.4.
5. Number of full-time equivalent employees on payroll at end of current period (Number)	RIAD 4150			M.5.
6. Cash dividends declared (to be reported only with March, June, and September Reports of Income)	RIAD 4475			M.6.

Item 7 is to be completed by banks with $25 million or more in total assets and with loans to finance agricultural production and other loans to farmers (Schedule RC-C, item 3) exceeding five percent of total loans.[2]

7. Interest and fee income on agricultural loans[1] (included in item 1.a above)	RIAD 4291	M.7.

[1] See instructions for loan classifications used in this schedule.

[2] The $25 million asset size test is based on the total assets reported on the June 30, 1985 Report of Condition.